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Bibliography on Evapotranspiration (1956–1959)

0 October 1959 No. 10

METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

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METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY is a monthly publication devoted to:

A. Current Abstracts in English on important meteorological literature in every language.

B. Bibliographic references to other items of interest to the profession.

C. Selective, annotated bibliographies on subjects of immediate and special interest to meteorologists.

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MALCOLM RIGBY, Editor

Vol. 10 OCTOBER 1959 No. 10

SPECIAL FEATURE IN THIS ISSUE

Bibliography on Evapotranspiration (1956–1959)

By
Geza Thuronyi

(For complete table of contents see back cover)

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LIST OF PERIODICALS

Note: This list contains the titles of the periodicals which regularly contain material on meteorology or related fields and it comprises only a small percentage of the periodicals from which pertinent articles are abstracted. The form of serial entry adopted by MAB is given in bold face type below.

PERIODICALS IN WHICH METEOROLOGICAL ARTICLES REGULARLY APPEAR

★**Acta Geophysica Polonica,** [Warsaw].
★**Acta Meteorologica Sinica,** [Peking].
★**Akademiia Nauk SSSR, Izvestiia, Ser. Geogr.** and **Ser. Geofiz.,** [Moscow].
American Geophysical Union, Transactions, [Washington].
★**American Meteorological Society, Bulletin,** [Boston].
★**Angewandte Meteorologie,** [Potsdam].
Annales de Géophysique, Central National de la Recherche Scientifique, [Paris].
★**Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A and Ser. B,** [Vienna].
★**Australian Journal of Physics,** [Melbourne]
★**Beiträge zur Physik der Atmosphäre,** [Frankfurt a. Main].
★**Ciel et Terre,** Société Belge d'Astronomie, Météorologie et Physique du Globe, [Brussels].
★**Geofisica e Meteorologia,** Società Italiana di Geofisica, [Genoa].
Geofisica Pura e Applicata, Istituto Geofisico Italiano, [Milan].
★**Geophysical Magazine,** Japan Meteorological Agency, [Tokyo].
Hemel en Dampkring, [The Hague].
★**Időjárás,** Magyar Meteorológiai Társaság and Országos Meteorológiai Intézet, [Budapest].
★**Indian Journal of Meteorology and Geophysics,** [Delhi].
★**Journal de Mécanique et de Physique de l'Atmosphère,** Société Météorologique de France.
★**Journal of Atmospheric and Terrestrial Physics,** [London].
Journal of Geophysical Research, [Washington].
★**Journal of Meteorological Research,** [Tokyo].
★**Journal of Meteorology,** American Meteorological Society, [Boston].
★**The Marine Observer,** Air Ministry, Meteorological Office, London.
★**The Meteorological Magazine,** Air Ministry, Meteorological Office, London.
★**Meteorologické Zprávy** [Prague].
★**Meteorological Society of Japan, Journal,** [Tokyo].
★**La Météorologie,** Société Météorologique de France, [Paris].
★**Meteorologiia i Gidrologiia,** [Leningrad].
★**Meteorologische Rundschau,** [Berlin].
★**Monthly Weather Review,** U. S. Weather Bureau, Washington, D. C.
Polarforschung, Archiv für Polarforschung, [Kiel].
★**Przegląd Geofizyczny,** [Warsaw].
Revista de Geofísica, Instituto Nacional de Geofisica, [Madrid].
★**Rivista di Meteorologia Aeronautica,** Servizio Meteorologico, [Rome].
★**Royal Meteorological Society, Quarterly Journal,** [London].
★**South Africa, Weather Bureau, Notos,** [Pretoria].
★**Tellus,** Svenska Geofysiska Föreningen, Stockholm.
Vsesoiuznoe Geograficheskoe Obshchestvo, SSSR, Izvestiia, [Leningrad].
★**Weather,** Royal Meteorological Society, [London].
★**Weatherwise,** American Meteorological Society, [Boston].
★**Wetter und Leben,** Österreichische Gesellschaft für Meteorologie, [Vienna].
★**WMO Bulletin,** World Meteorological Organization, [Geneva].
★**Zeitschrift für Meteorologie,** Meteorologisches Observatorium, Potsdam.

★ Indicates those periodicals which are primarily meteorological.

FOREWORD

Meteorological Abstracts and Bibliography is a monthly publication whose purpose is to ring to the attention of meteorologists current literature in their field.

Part I contains abstracts of current literature in the fields of meteorology, etc.

Part II of each issue comprises an annotated bibliography of important references on a pecial subject (usually arranged chronologically).

Bibliographies published in the successive issues were:

Vol. I, 1950

. Atmos. Pollution 2. Aerobiology 3. Cloud Physics 4. Hail
. Tornadoes 6. Volcanic Dust 7. Climat. Changes 8. Thunderstorms
. Icing 10. Acoust. Propagation 11. Evaporation

Vol. II, 1951

. Extended Forecast. 2. Long Range Forecast. 3. Soil Temp. 4. Constants, etc.
. Clim. of Near East 6. Clim. of Middle East 7. Special Winds 8. Radar Storm
. Condensation Trails 10. Clim. of N. E. Africa 11. Mountain Met. Detect.

Vol. III, 1952

. Clim. of N. W. Africa 2. Carbon Dioxide 3. Clim. of Argentina, etc. 4. Dew
. Objective Forecast. 6. Stratus Forecast. 7. Urban Climatology 8. Clim. of C. Africa
. Visibility 10. Glaze and Rime 11. Free Air Turbulence

Vol. IV, 1953

. Turbulence Theory 2. Turbulent Diffusion 3. Frost 4. Clim. of Australia, etc.
. High Level Winds 6. Winds in Stratosphere 7. Jet Stream 8. Radiation Bioclim.
. Clim. of Pacific 10. Auroras 11. Sferics

Vol. V. 1954

. Oceanog. Met. 2. Clim. of S. E. Asia 3. Auroral Physics 4. Tropopause
. Balloons 6. Numerical Forecast. 7. Radiation Data 8. Vertical Motion
. Clim. of Arctic 10. Industrial Met. 11. Wind Waves and Swell

Vol. VI, 1955

. Bibliog. of Bibliog. 2. Texts & Monogr. Bibliogs. 3. Storm Surges
. Ionospheric Prop. 5. Photochem.—Upper Atmos. 6. Cloud Physics
. Radar Cloud Physics 8–9. Atmos. Nuclei 10. Weather Modification 11. Cooling Power

Vol. VII, 1956

. Synoptic Met.-Arctic 2. Clim. of Enclosed Spaces 3. Cosmic Rays (–1952)
. Cosmic Rays (1953–56) 5. Atmos. Radioactivity 6. Inversions
. Snow Micromet. 8. Snow Micromet. (Suppl.) 9–11. Tropical Cyclones

Vol. VIII, 1957

. Solar Weather Relations 2. Night Airglow 3. Forecasting Special Elements
. Forest Micrometeorology 5. Hydromet. Forecasting 6. Numerical Forecast. (Suppl.)
. Albedo 8. Meteors 9–10. Tropospheric Prop. 11. Medical Meteorology

Vol. IX, 1958

. Radioastronomy 2. Solar Astrophysics 3. Radioactivity in Atmosphere
. Waves and Currents 5. Physical Oceanog. 6. Dynamic & Phys. Oceanog.
. Long Range Forecast. 8. Radar Met. 9. Cosmic Rays 10–11. Geomagnetism

Vol. X, 1959

1. Works of C. E. P. Brooks 2. Tornado Forecasting 3. Soil Moisture 4. Sferics
–6. Ozone 7. Acoustic Waves 8. Evaporation Measurement
9. Evapotranspiration (–1955) 10. Evapotranspiration (1956–1959)

Other bibliographies in preparation are:

Actinometers	*High Atmosphere Temperatures*	*Singularities*
Forecast Verification	*Micrometeorology*	*Synoptic Aerology*
Frost	*Radiation*	*Thunderstorms*

Part III contains a listing of reviews, translations, reprints, and the contents of important ublications. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes. The December issue omprises cumulative author, subject, geographical and journal indexes.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where the material may be found. The Union List of Serials (Gregory) is the source of most of the symbols used. In some cases, where no symbol has been assigned to a library, one will be devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DNLM:	U. S. National Library of Medicine, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by charts.

Geographic locations are in the English form rather than the form used locally, for example Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwise stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet according to the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months are abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Number (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus an entry will read as follows:

Meteorologische Rundschau, 2(5/6):146–151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau*, *Jahrgang* 2 (Vol. 2), *Heft* 5/6 (No. 5/6), *pages* 146–151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL MATERIAL

MAJOR GENERAL WORKS

COLLECTED WORKS

10.10–1 551.506.22(08) 551.507.362.2

Akademiia Nauk SSSR. Mezhduvedomstvennyĭ Komitet po Provedeniiu Mezhdunarodnogo Geofizicheskogo Goda, **Informatsionnyĭ Biulleten'** [Information Bulletin], No. 5, **1958.** 18 p. figs., refs., tables. On t-p.: Mezhdunarodnyĭ Geofizicheskiĭ God, Année Géophysique nternationale. **DWB.** For listing of contents, *see* Pt. III, p. 1455, Nov. 1958, *MAB*. All rticles abstracted separately.—The contents of this publication include the following classes of subjects: the collection, maintenance and analysis of IGY material; apparatus and observational methods; scientific investigations during the IGY; summaries of a number of articles dealing with the investigation of the upper atmosphere with the aid of artificial earth satellites that have been published in **Uspekhi Fizicheskikh Nauk,** Vol. 63, No. 1, Sept. **1957** (for list of contents, *see* Pt. 3, p. 384, March 1958, *MAB*); various scientific events in the U.S.S.R. associated with the IGY, such as establishment of committees, artificial earth satellite observations, special IGY conferences, occurrences of interest at the Soviet Antarctic station, Soviet IGY publications, etc; and a summary of IGY news outside the U.S.S.R. based upon information contained in **IGY News, IGY Bulletin** and in the magazine **Discovery.** *Subject Headings:* **1. IGY collected papers 2. IGY data analysis 3. Upper atmosphere research 4. IGY satellite program 5. U.S.S.R.**—*I.L.D.*

10.10–2 551.579.5(08)

India. Central Board of Geophysics, **Proceedings of the Symposium on Ground Water, New Delhi, Feb. 1955.** Pub. Calcutta, **1958.** 400 p. figs., tables, refs. **DWB**—This large volume contains 36 papers of the 60 presented at the symposium on many aspects of ground water hydrology in India. Several overseas participants (from U. S., U. K., U.S.S.R., South Africa, Ceylon and Holland) attended the conference which was held on Feb. 1 and 2, 1955. Many of the papers contain data on climate, rainfall, soil moisture, infiltration, use of wind power, calculations, etc. *Subject Headings:* **1. Ground water symposia 2. India.**—*M.R.*

10.10–3 551.58:551.584:551.585.5(08)

United Nations Educational, Scientific and Cultural Organization, **Climatology and microclimatology: proceedings of the Canberra Symposium, Oct. 1956.** Its *Arid Zone Research*, Vol. 11, pub. **1958.** 355 p. figs., tables, bibliogs., eqs. throughout. Title-page in English and French. Text and resumes in French and/or English. For listing of contents, *see* Pt. III, p. 1280, Aug. 1959, *MAB*. All articles abstracted separately. **DWB** (M84 U58eL), **DLC** (QC993.7.U52). Review by Osvaldo Baldacci in *Società Geografica Italiana, Bollettino*, Ser. 8, 11(4/5):235–239, April/May **1958.** Review by S. R. Eyre in *Geographical Journal*, 125(2):270, June **1959.** Review in *World Meteorological Organization, WMO Bulletin*, 7(4):187, Oct. **1958.**—This volume contains the papers of the Australian and foreign scientists invited by the UNESCO to the international symposium at Canberra on the climatology, and particularly the microclimatology, of arid zones. Eight sessions were held and about 50 papers presented. The subjects treated at the different sessions were: evaporation and the water balance (9 papers); radiation and the thermal balance (7 papers); interrelationships of climatic elements and flora (13 papers); interrelationships of climatic elements and fauna (3 papers); microclimate of man and domestic animals (4 papers); modifications of microclimate (5 papers); salting and chemistry of rainwater (2 papers); climatological observational

requirements in arid zones (7 papers). In general, each paper is accompanied by a summary and bibliography. Each section is followed by a summary of the discussions and conclusions. The work contains an index of the authors quoted and of the subjects. It constitutes a synthesis work and brings an important contribution not only to the climatology and microclimatology of the arid zone, but also to the climatology and microclimatology in general sense. *Subject Headings:* **1. Arid zone climatology 2. Climatology symposia 3. Microclimatology of arid zones 4. Evaporation 5. Radiation balance 6. Chemical composition of rainwater.**—*A. V.*

10.10–4 551.507.362.2 (08)

Massachusetts Institute of Technology. Lincoln Laboratory, **Collection of Soviet papers on earth satellites.** Issued Oct. 31, **1957**; reissued Jan. 13, **1958.** 182 p. figs., tables, refs., eqs. **DWB** (629.1388 M414co)—Contents: Vakhnin, V., **Artificial earth satellites** (from *Radio*, No. 6:14–17, June **1957**). Kazantsev, A. N., **Observation of radio signals from an artificial earth satellite and their scientific value,** p. 6–15 (from *Radio*, No. 6:17–19, June **1957**). Mikhailov, A. A., **Observation of the artificial satellite,** p. 16 (from *Astronomicheskiĭ Tsirkuliar*, No. 180:1, May 18, **1957**). The following papers were all originally printed in *Uspekhi Fizicheskikh Nauk*, Moscow, Vol. 63, No. 1, Sept. **1957.** Danilin, B. S. et al., **Problem of the measurement of pressure and density of the upper layers of the atmosphere with the aid of an artificial earth satellite,** p. 17–48. Ginzburg, V. L., **Use of artificial earth satellites for the purpose of proving general relativity theory,** p. 49–54. Mikhnevich, V. V., **Measurement of pressure in the upper atmosphere,** p. 55–65. Vernov, S. N. et al., **Investigation of the composition of primary cosmic rays,** p. 66–88. Vavilov, V. S. et al., **Silicon solar batteries as electric power sources for artificial earth satellites,** p. 104–112. Iatsunskiĭ, I. M., **The effect of geophysical factors on satellite motion,** p. 113–130. Okhotsimskiĭ, D. E. et al., **Determining the lifetime of an artificial earth satellite and an investigation of secular perturbations of its orbit,** p. 131–152. Poloskov, S. M. and Nazarova, T. N., **Investigation of solid components of interplanetary matter by means of rockets and artificial earth satellites,** p. 153–170. Taratynova, G. P., **Motion of an artificial satellite in the noncentral gravitational field of the earth in the presence of atmospheric resistance.** (For listing of these titles in original Russian, *see* 9(3):384–385, March 1958, *MAB*. These articles abstracted separately.) *Subject Headings:* **1. Collected satellite papers 2. Soviet satellite literature.**

10.10–5 551.5:63:061.3

†U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby, **Voprosy agrometeorologii: sbornik kratkikh soobshcheniĭ dlia vtoroĭ Sessii Komissii Sel'skokhoziaĭstvennoĭ Meteorologii Vsemirnoĭ Meteorologicheskoĭ Organizatsii.** [Agrometeorological problems: compendium of abridged reports to the second session, Commission for Agricultural Meteorology of the World Meteorological Organization.] Ed. by F. F. Davitaia and M. S. Kulik. Moscow, Gidrometeoizdat, **1958.** 90 p. tables, bibliography at end of each ch. All articles abstracted separately. **DWB**—A collection of 17 papers by various authors on as many aspects of the wide range of subjects embraced by the agrometeorological service of the U.S.S.R., for presentation at the 2nd session of the Agrometeorological Commission meeting in Warsaw. Articles cover types of stations at collective and state farms and experiment stations, soil moisture measurements, phenological observations, methods of measuring moisture content of crops, harvest data, agrometeorological indexes of drought, microclimatological surveys, sheep pasturing conditions in winter, etc. *Subject Headings:* **1. Soviet agrometeorological services 2. Soil moisture measurements 3. WMO Agricultural Meteorology Commission 4. U.S.S.R. I. Davitaia, F. F.** (*ed.*) **II. Kulik, M. S.** (*ed.*).—*M.R.*

10.10–6 52 (08)

*†Beer, Arthur (*ed.*), **Vistas in astronomy.** London, Pergamon Press, **1955.** 2 vol. (Vol. 1, 776 p. Vol. 2, p. 779–1770). figs., tables, refs., bibliogs., eqs. Indexes in Vol. 2. (Special Supplements, No. 3 and 4, to the **Journal of Atmospheric and Terrestrial Physics**) (For listing of contents of pertinent articles, *see* Pt. III, p. 1458, Nov. 1958, *MAB*. These articles abstracted separately.) **DLC** (QB3.B35), **DWB** (520.82 B415v). Review by H. H. Voigt in

die Naturwissenschaften, Berlin, 45(17):427, Sept. 1, **1958.** Review by B. Vorontsov-Vel'iaminov in *Astronomicheskiĭ Zhurnal*, Moscow, 35(3):496–498, May/June **1958.**—Vol. I of this series of "compendiums" on astronomy and astrophysics included 7 sections: organization, history, dynamics, theory, instruments, radio astronomy and solar physics. The second volume covers sections 8–16 (including 100 articles by authorities): solar-terrestrial relations, geophysics, planetary systems, stellar astronomy, photometry, spectroscopy, novae, galaxies and, lastly, cosmogony and cosmology. The section on solar-terrestrial relations (p. 779–826) contains 6 articles on the ionosphere (SIR EDWARD APPLETON), absorption of radio waves in the ionosphere (J. A. RATCLIFFE), solar flares (M. A. ELLISON), M-regions and solar activity (M. WALDMEIER), the corpuscular radiation of the sun (M. J. SMYTH), and solar cosmic rays (P. M. S. BLACKETT). In the section on geophysics there is an article on thunderstorm (E. T. PIERCE), atmospheric CO_2 (LEO GOLDBERG), infrared spectrum of atmosphere (T. W. VORMELL), the O_3 layer and the 9.6μ O_3 band (R. M. GOODY and C. D. WALSHAW), O_3 near the North Pole (A. E. DOUGLAS et al.), upper atmosphere rocket soundings (S. F. SINGER), geomagnetic storms and bays (SYDNEY CHAPMAN), and the airglow (DANIEL BARBIER). In the section on the planetary system, LUIGI G. JACCHIA and F. L. WHIPPLE have an article on the Harvard photographic meteor program, MIROSLAV PLAVEC has one on the evolution of meteor streams, and H. C. VAN DE HULST has one on the zodiacal light. Finally, in the last section (16) F. A. PANETH has an article on the frequency of meteoritic falls through the ages, and HAROLD C. UREY one on the origin and properties of the moon's surface. Each article is abstracted separately and will be run in later issues of *MAB*. Extensive bibliographies accompany many of the articles, and illustrative material in the form of diagrams, photographs and tables are interspersed throughout the text. *Subject Headings:* **1. Astronomy 2. Astrophysics.**—*M.R.*

10.10–7 551.501.81:061.3

Weather Radar Conference, 7th, Miami Beach, Fla., Nov. 17–20, 1958, **Proceedings (of the Conference, sponsored by) Radar Meteorological Committee, American Meteorological Society and Radar Meteorological Section, Marine Laboratory, University of Miami.** [Pub. 1958] Sections A–K (each separately paged). About 550 p., looseleaf, with many illustrations of all types. (For listing of contents, *see* Pt. III, p. 1629, Oct. 1959, *MAB*.) All papers abstracted separately. **DWB** (M01.81 R124pc, 1958)—Attendants are listed and shown in photograph. Papers fall under the following headings: A) Cloud and precipitation physics (7 papers); B) Particle structure, size, distribution and scattering (6 papers); C) Sferics (3 papers); D) Radar propagation, angels, etc. (8 papers); E) Continuation of D (9 papers); F) Instrumentation (9 papers); G) Continuation of F (6 papers); H) Operational techniques (7 papers); I) Synoptic interpretations (6 papers); J) Radar climatology (4 papers); and K) Severe storms (10 papers). Each group of papers is followed by a summary of discussions on each paper. *Subject Headings:* **1. Weather Radar Conference, 7th, 1958 2. Radar conferences 3. Miami, Florida. I. American Meteorological Society II. Miami. University at Coral Gables). Marine Lab.**—*M.R.*

10.10–8 551.506.5 91.04(99)

Deutsche Antarktische Expedition, 1938/1939, **Wissenschaftliche Ergebnisse** [Scientific results], Vol. 2, issued Hamburg, Geographisch-Kartographische Anstalt "Mundus," **1954–1957/1958.** Vol. 2 in 2 Pts. Contents, Pt. 1 (Pub. 1954), Kosack, H. P.: **Die Neubearbeitung der Übersichtskarte des Arbeitsgebietes der Expedition** [New edition of the general map of the area covered by the Expedition], p. 1–15. Regula, Herbert: **Die Wetterverhältnisse während der Expedition und die Ergebnisse der meteorologischen Messungen** [Weather conditions during the Expedition and the results of meteorological measurements], p. 16–40. Pt. 2 (Pub. 1957/1958), Schumacher, Arnold: **Die Lotungen der "Schwabenland"** [The soundings of the "Schwabenland"], p. 41–60. Model, Fritz: **Ein Beitrag zur regionalen Ozeanographie der Weddellsee** [Contribution to the regional oceanography of the Weddell Sea], p. 63–96. Gburek, Leo: **Erdmagnetische Messungen, Eisuntersuchungen, Strahlungsmessungen und Kernzählungen** [Geomagnetic measurements, ice investigations, radiation measurements and nuclei count], p. 97–100. **DWB** (919.9 D486w)—The first volume of this

report (*see* 6.10–20, Oct. 1955, *MAB*), contained general information and cartographic material on the 1938/39 Antarctic expedition of the aircraft carrier "Schwabenland" under Captains A. KOTTAS and A. RITSCHER. The scientific results are contained in this second volume which was long delayed by wartime and post-war events. Among the data presented, the results of radiosonde ascents are of the greatest interest from a meteorological point of view. Other tables and charts include hydrographic, bathymetric and cartographic results. A major portion of the meteorological (and some of the other) records were destroyed during the war. Each section of the report is being abstracted separately. *Subject Headings:* **1. German Antarctic Expedition, 1938/1939 2. Antarctic expeditions 3. Antarctica.**—*G.T.*

10.10–9 551.515.2:061.3

Technical Conference on Hurricanes, Miami Beach, Fla., Nov. 19–22, 1958, **Proceedings of the (First) Technical Conference . . . under the joint sponsorship of the AMS Committee on Severe Storms and the Miami Meteorological Society.** Issued **1958** (?). 48 papers, each repaged. figs., tables, refs., eqs. "Expanded abstracts of formal papers presented at the Conference. Digest of the discussions and conclusions of the Board of Review expected to be published." For listing of contents of the **Proceedings,** *see* Pt. III, p. 1626, Oct. 1959, *MAB*. All papers abstracted separately. **DWB** (M15.2 A512pr). *Subject Headings:* **1. Hurricane conferences 2. Technical conference on Hurricanes, 1st, Miami Beach, Nov. 1958. I. American Meteorological Society.**

TEXTBOOKS AND TECHNICAL BOOKS

10.10–10 551.5:629.13(02)

§Ångström, Anders, **Meteorologi.** [Meteorology.] Stockholm, Albert Bonniers Förlag, **1957.** 285 p. 115 figs., tables, 12 refs., eqs. **DWB** (M:629.13 A112me)—A standard, but up-to-date, elementary text in meteorology and climatology, obviously intended for aviation students in Sweden, but with considerable new and original material and many original sketches and photographs. The 21 chapters cover: atmosphere, weather, energy exchange between earth and atmosphere, temperature, moisture, cloud, precipitation, frost and glaze, visibility, fog and haze, pressure, pressure-wind relationships, squalls, convection and turbulence, cyclones and anticyclones, general circulation, thunderstorms, synoptic analysis and forecasting, aerological charts, aviation forecasting, instruments and methods and, finally, climate. Numerous climatic diagrams for individual places all over the world show seasonal temperature and rainfall regimes. The subject index gives a good key to Swedish meteorological terminology. *Subject Headings:* **1. Aeronautical meteorology textbooks 2. Swedish language.**—*M.R.*

10.10–11 551.511:551.551(02)

†Priestley, C. H. B. (*Chief, Div. Met. Physics, C.S.I.R.O., Australia*), **Turbulent transfer in the lower atmosphere.** Chicago, Univ. of Chicago Press, **1959.** 130 p. 22 figs., 10 tables, 123 refs., eqs. Price: $3.75. **DLC**—A thorough monograph based on a series of lectures on turbulent transfer given by the author at the Univ. of Chicago in 1951 and expanded to include a chapter on evaporation and a section on geostrophic wind approximation, plus considerable recent material not available at the time of the lectures. After an introductory chapter (Ch. 1) there is one (Ch. 2) on eddy flux and its measurement; one (Ch. 3) on shearing stress and wind profiles, (4) heat convection and temperature profile, (5) spectrum of turbulence and structure of free convection; (6) theories of buoyant motion, (7) evaporation and (8) evolutionary aspects of energy transfer (diurnal and air mass and latent heat effects). The balance between theory and pertinent experimental results is nicely maintained throughout the book. The chapter on evaporation is restricted to basic work on turbulent transfer in the atmosphere, using the aerodynamic approach on the one hand and the energy balance method on the other (enabling calculations of dew). Formulas for quantitative estimation of evaporation from saturated and from open water surfaces for inclusion of stability, light winds, bare soil and grass, and latent heat are included. A good bibliography of papers cited in this unique book is appended along with an author and subject index. *Subject Headings:* **1. Turbulent transfer textbooks 2. Shear stress 3. Evaporation.**—*M.R.*

10.10–12 551.5(02)

†Brunt, David, **Fizicheskaia i dinamicheskaia meteorologiia.** [Physical and dynamic meteorology.] ed. by B. I. Izvekov. Leningrad, Gidrometeoizdat, **1938.** 398 p. 112 figs., tables, foot-refs., bibliogs., eqs. **DLC** (QC861.B728)—According to B. I. Izvekov, editor of the Russian translation, the book (3200 copies) is a very well planned course of physical and dynamic meteorology, well suited for use in universities and hydrometeorological institutes. It contains abundant material on the physics of atmospheric processes, their causes and interaction. The comprehensive chapters on thermodynamics, radiant energy and its transformation in the atmosphere (Ch. 5, 6, 7), as well as the chapters on atmospheric turbulence (Ch. 12, 13) containing a most complete exposition of these problems, are of special interest. Several extensive notes dealing with works of Brunt and others, and works of Soviet investigators on theoretical meteorology, published after 1934, are included as a supplement to the Russian edition. *Subject Headings:* **1. Dynamic meteorology textbooks 2. Physical meteorology textbooks 3. Translations.**—*A.M.P.*

10.10–13 551.46(02)

*†Bruns, Erich (*Geophysical Inst., Leipzig Univ.*), **Ozeanologie, Bd. 1, Einführung in die Ozeanologie; Ozeanographie.** [Oceanology, Vol. 1, Introduction to oceanology; oceanography.] Berlin, Deutscher Verlag der Wissenschaften, **1958.** 420 p. 145 figs., 85 tables, 172 refs. Geographic, personal name, subject, illustration and table indexes. **DWB** (551.46 B899oz), **DLC** (GC11.B77). Review by Gerhard Neumann in *American Meteorological Society, Bulletin,* 40(11):580, Nov. **1959.**—A competent textbook on the technical aspects of oceanography (as a branch of oceanology) consisting of hydrological and hydrographic methods and results as pertaining to oceans and their borders. This volume is the first in a 4 volume "handbook" (the second volume will deal with oceanometry or measurements and equipment for measuring parameters pertinent to oceanography, and the 3rd and 4th with oceanology *per se* or as a science). The first 5 chapters comprise an introduction to oceanology (hydrology, hydrometry, relation of oceanology to hydrology and geophysics, oceanometry and development of expeditionary investigations of the oceans). The next 2 chapters (6 and 7) deal with measurement of bottom relief in oceans and seas, and in specific areas. Ch. 8–13 cover fundamentals and methods of organizing and conducting oceanographic work (ships and navigation sea charts, nautical handbooks and directions or guides, navigation methods, sea surface surveying, bottom surveying in deep and shallow water); Ch. 14–22 deal with hydrological characteristics of oceans and seas (Atlantic Ocean, Atlantic bordering seas, Pacific, Pacific bordering seas, Indian Ocean, Indian seas, Arctic Ocean, Arctic seas and, finally, the great seas of Eurasia). For each of the oceans or seas, the bottom relief, geological character, currents, tides, waves, temperature, salinity, density, transparency, color, ice and hydrochemistry are discussed wherever data are available. Extensive author, geographical and subject indexes, a good bibliography, a list of figures and tables, and a systematic outline of contents are appended. Many small charts are included in the text as well as a number of folded charts in pocket at end of volume, and considerable exemplary data, tables useful in calculations, a table giving data on 305 oceanographic expeditions from 1734 to 1955 (76 Russian, 60 British, 45 U. S., 37 German, 20 French, 17 Norwegian and <10 from each of 13 other countries), plus many schematic drawings, photos of equipment, etc. *Subject Headings:* **1. Oceanography textbooks 2. Oceanology handbooks 3. Hydrography textbooks 4. Oceanographic expeditions.**—*M.R.*

10.10–14 551.574.1(02):551.510.42

*Avy, Alban Paul (*Lab. Central des Services Chimiques*), **Les aérosols.** [Aerosols.] Pref. by C. Drouard. Paris, Dunod, **1956.** 292 p. numerous figs. and tables, foot-refs. **DWB** (M74.1 A969ae)—A technical or engineering type of text covering theory and applications of theory and measurements of five particular aerosols. The first part deals with general properties of particles and their measurement (gravity, Brownian movement, diffusion, form, density, vapor pressure, evaporation, electricity, effect of heat, light, etc.), and then particulate clouds (dispersion, formation, coagulation, ultra-sonic effects, instruments, observation, counting, etc.). Pt. II deals with applications to problems of industrial hygiene, removal of industrial dust, military applications, atmospheric pollution and, finally, meteorological applications and vice versa (cloud and fog formation, artificial precipitation, atmospheric electricity,

optical phenomena), and fumigation of crops and forests, dust explosions and unsolved problems. *Subject Headings:* **1. Aerosol textbooks 2. Micromeritics 3. Cloud physics 4. Atmospheric pollution.**—*M.R.*

10.10–15 551.586:581.5(02)

†*Lundegårdh, Henrik, **Klima und Boden in ihrer Wirkung auf das Pflanzenleben.** [Climate and soil in their influence on plant life.] 5th rev. ed. Jena, VEB Gustav Fischer Verlag, **1957.** 584 p. 145 figs., 47 tables, foot-refs., eqs. **DWB** (M86:580 L962kL 1957). Review by R. Knepple in *Angewandte Meteorologie*, Berlin, 3(2):62, **1957.**—The present text is the outcome of a series of lectures made in 1923–24 at Brünn Univ., Czechoslovakia. Four editions in German (and 3 in other languages) had appeared by 1953. (For abstract on 4th rev. ed., *see* 7.10–6, Nov. 1956, *MAB.*) The advances in ecology during the past decade made a complete revision with many new illustrations necessary. Effects of light, temperature, water, soil, chemicals, microorganisms, carbon dioxide and, finally, miscellaneous factors such as species, varieties, adaptation, etc., and experimental work in ecology are treated thoroughly in separate chapters, each with many systematic subdivisions. Exhaustive author and subject indexes, and large color charts of the earth showing mean annual precipitation and vegetation types, respectively, are appended. Hundreds of foot-references are also to be found. Meteorological factors are given great stress throughout—for instance, the first 15 pages after the historical section deal with the radiation climate of the earth, then major sections are devoted to the effect of light on growth, and on photosynthesis, the radiation climate of plant communities (alpine, desert, coastal, arctic, subarctic), effects of exposure, latitude, length of day, of woods, of tropical rain forests, of soil and rocks and the regional distribution of light in water. Temperature effects on growth, respiration, photosynthesis, cold resistance and injury, heat resistance and injury, periodicity in temperature as an ecological factor, soil temperature effects, temperature climates of the earth, water balance, soil moisture, water transport, daily transpiration regime, measurement of transpiration and water balance and moisture considerations in various regional types of community are considered. The approach is quantitative throughout with ample graphical and tabular material based on experimental research incorporated in text. *Subject Headings:* **1. Physiological plant ecology 2. Climatic effects on plant life 3. Ecology textbooks 4. Climate—soil relationships.**—*M.R.*

10.10–16 551.5:629.13(02)

†Förchtgott, Jiří, **Letecká meteorologie.** [Aviation meteorology.] 2d ed. Prague, Státní Nakl. Technické Literatury, **1953.** 194 p. 104 figs., 11 charts, 8 tables, 25 refs. (*Řada Dopravní Literatury*, Vol. 31), **DLC** (TL556.F62 1953)—A standard elementary text on aeronautical meteorology beginning with basic synoptic meteorology in all of its aspects, then taking up thermal turbulence and, finally, mechanical turbulence. Numerous graphs, recorder records, sounding diagrams, schematic diagrams and actual synoptic charts, photographs of equipment, etc. are included by way of illustration of the various weather types or occurrences especially related to Czechoslovakian flying. It is evident that orographic effects on wind are of primary importance in aviation in Czechoslovakia. *Subject Heading:* **1. Aeronautical meteorology textbooks.**—*M.R.*

10.10–17 551.510.535(02)

Dumont, René, **L'ionosphère et l'optique géométrique des ondes courtes.** [The ionosphere and the geometric optics of short waves.] Paris, Dunod, **1958.** 100 p. 33 figs., 11 refs. (*Monographies Dunod*, No. 3.) **DWB** (M10.535 D893io), **DLC** (QC879.D85). Review in *La Météorologie*, Paris, Ser. 4, No. 49:75, Jan./March **1958.**—A pocket-size textbook giving basic and up-to-date information on the ionosphere and its formation, structure, radio wave propagation, sounding by vertical pulses and by study of photochemistry, absorption, geomagnetic fluctuations, optical phenomena, meteors and rockets. Characteristics of the different layers, applications to long-distance radio, propagation, forecasting of ionospheric and radio propagation conditions, etc. are discussed. Aurora, airglow, sunspots, satellites, ionospheric tides and various theories are treated incidentally. Numerous schematic diagrams, an author and subject index are included. *Subject Headings:* **1. Ionosphere textbooks 2. Ionospheric sounding.**—*M.R.*

10.10–18 551.579(02)(472)

*Uryvaev, V. A., **Eksperimental'nye gidrologicheskie issledovaniia na Valdae.** [Experimental hydrologic investigations in Valdai.] Leningrad, Gidrometeoizdat, **1953.** 230 p. 14 tables, photos and figs., 21 refs. **DWB**—The history and early results of the hydrologic investigations at the Valdai hydrologic research station since 1933, basic problems and conduct of work at the station, details of runoff investigations (model or experimental equipment, instruments, networks or plots), data on annual runoff, spring meltwater runoff and rain runoff; infiltration losses, studies of showers, snow cover and snow melt studies; evaporation from water surfaces, from fields, forests, soil, and forest soil are subjects of various chapters. Considerable data and illustrations of many types of usual and unusual instruments and equipment (evaporimeters, lysimeters, model basins for experimental work and calibration, etc.) are included. *Subject Headings:* **1. Valdai Hydrological Station 2. Hydrological experiment stations 3. Hydrological equipment 4. Valdai, U.S.S.R.**—*M.R.*

10.10–19 550.38(09)

†Balmer, Heinz, **Beiträge zur Geschichte der Erkenntnis des Erdmagnetismus.** [Contribution to the history of the knowledge of terrestrial magnetism.] Aarau, Verlag H. R. Sauerländer, **1956.** 892 p. 45 figs. (unnumbered), bibliog., refs. throughout. Bibliog. by sections, p. 583–659. Biographic section (with refs.), p. 663–866. (*Schweizerische Gesellschaft f. Geschichte der Medizin und der Naturwissenschaften, Veröffentlichung*, Vol. 22.) **DLC** (QC804.B3). Review in *Die Umschau*, 57(17):541, Sept. **1957.**—An exceedingly scholarly and voluminous treatise on all aspects of the history of geomagnetism and the biography of all those contributing to our knowledge of the Earth's magnetism, starting in Pt. I (p. 27–230) with the Chinese magnetic carriage (200 B.C.) and development of the ship's compass (ca. 600 A.D.); going on to the discovery of magnets and the introduction of the compass into the West (Greece, Rome, France, the Arab countries, etc.) before the 13th Century; its use by Marco Polo and others from the Mediterranean; the discovery of the variations in the compass (Columbus, Spanish, Portuguese and German developments); the history of the mariner's compass; observations and charts of the magnetic deviations and the calculation of the inclination and declination of the magnetic poles; William Gilbert's work and the differentiation of electricity and magnetism; discoveries of the temporal changes in declination, Edmond Halley; inclination determinations and the magnetic equator and pole; intensity of geomagnetic field, terminology and diurnal variations. Pt. II (p. 231–520) gives extensive quotations and biographical material on 18 of the chief contributors to geomagnetism: Lucretius, Pliny, Petrus Peregrinus, Rheticus, Hartmann, Pedro de Medina, Mercator, Norman, Stevin, Gilbert, Kepler, Galilei, Fournier, Halley, Humboldt and others. Pt. III (p. 521–579) takes up: (1) the legends of the Magnetic Mountain from Pliny to **Gulliver's Travels,** (2) the precursor of the magnetic telegraph about the time of Galilei, and (3) the work on geomagnetism in Switzerland (1500–1700 and 1700–1950), and a list of sources and quotations (p. 581–659). Finally, there is a very complete biographic register (p. 661–866) of scores of contributors to the subject from earliest times, an author and title index, a list of translations from Latin, French and English, and a list of illustrations in chronological and in subject order. *Subject Headings:* **1. History of geomagnetism 2. Geomagnetism 3. Biographies of geomagneticians 4. Compass 5. Magnetic poles.**—*M.R.*

10.10–20 551.582:631.4(479.24)

†Volobuev, V. R., **Pochvy i klimat.** [Soil and climate.] Baku, Akademiia Nauk Azerbaĭdzhanskoĭ SSR, **1953.** 319 p. 90 figs., 14 tables, 425 refs. At head of t-p.: Akademiia Nauk Azerbaĭdzhanskoĭ SSR, Institut Pochvovedeniia i Agrokhimii. Added t-p. in Azerbaidjani. **DLC** (S591.V67). Review by Michal Strzemski in *Przegląd Geograficzny*, Warsaw, 27(1):164–166, **1955. DLC**—A sizeable treatise on soil-climatic relationships, elements, classifications, etc., starting with 2 chapters on the historical contribution and ideas of Dokuchaev, Voeĭkov and K. D. Glinka (before the revolution) and of V. P. Vil'iams, L. S. Berg, N. N. Ivanov, L. I. Prasolov and many others (since the revolution). The second major portion of the book deals with soil formation under various climatic conditions (general, local and microclimatic influences, influence of temperature, precipitation and wind; biological influences and, finally, the effect of the hydrothermal condition). The third part deals with

research on soil-climatic relations in the Soviet Union and the U. S. and on the relation between soil mass and climate, pH of the soil and climate, etc. Pt. 4 goes briefly into conservation and reclamation of the soil in connection with climatic conditions and the "Great Stalin Plan for Transformation of Nature." Temperature, moisture, chemical and mineral composition, gaseous content of soil under varying geographic conditions from the tropics to the Arctic are analyzed from a quantitative as well as descriptive point of view. Ample experimental data in the form of tables and graphs, scatter diagrams, nomograms, maps of the world, the U.S.S.R., the U. S. and Azerbaidzhan in particular, are included. The text has one important omission—a subject index. 425 articles, 391 of which are from Rùssian sources, are cited in the most thorough bibliography. *Subject Headings:* **1. Soil-climate relationships 2. Soil moisture 3. Soil temperature 4. Soil climate bibliographies 5. U.S.S.R. 6. Azerbaidzhan S.S.R.** —*M.R.*

10.10–21 551.509.334(02)

†*Isaev, E. A., **Preemstvennost' nekotorykh tipov sinopticheskikh protsessov.** [The succession of several types of synoptic processes.] Leningrad, Gidrometeoizdat, **1958.** 195 p. 41 figs., 33 tables+tables in appendix, 73 refs. At head of title: Glavnoe Upravlenie Gidromet. Sluzhby pri Sovete Ministrov SSSR. Glavnaia Geofiz. Obs. **DLC** (QC880.I74)—A book summarizing the ideas and data on the succession of synoptic types or processes which lead to cold waves in autumn, winter, and spring or heat waves in the warm seasons, etc. The theories of V. V. Shuleĭkin regarding thermobaric waves, application of periodogram analysis to waves of varying periods, research on rhythms, successions of processes, long waves, the Multanovskiĭ theory and other Russian theories are reviewed. The mechanisms of the general circulation, centers of action (the Gulf Stream, cold and hot waves) at different seasons, types of accelerated or decelerated processes in the early or late stages of development, respectively, and other aids to seasonal forecasting by types and successions of types are reviewed. Numerous statistical tables and many charts illustrating trajectories of types in different seasons are included. *Subject Headings:* **1. Seasonal forecasting textbooks 2. Long range forecasting 3. Synoptic types, U.S.S.R.**—*M.R.*

MONOGRAPHS AND COMPREHENSIVE PAPERS

10.10–22 551.551.8:533.15:551.510.42

†Priestley, C. H. B.; McCormick, R. A. and Pasquill, F., **Turbulent diffusion in the atmosphere: report of a working group of the [WMO] Commission for Aerology.** *World Meteorological Organization, [Publication], WMO,* No. 77. TP. 31; *Technical Note,* No. 24, **1958.** 68 p. form, bibliog. p. 60–68. French, Russian and Spanish summaries preceding p. 1. **DWB.** Review in *World Meteorological Organization, WMO Bulletin,* 8(1):43–44, Jan. **1959.** Review by Morton L. Barad in *American Meteorological Society, Bulletin,* 40(11):582–583, Nov. **1959.**—A vast amount of recent literature on turbulent diffusion theory, diffusion of water vapor in the lower atmosphere, and applications to problems of air pollution in industrial regions is critically reviewed in systematic fashion. Transfer theory and its physical limitations, statistical theories (Taylor's, Sutton's, Frenkiel's, etc.) and their applications, effect of stability, space and time scales on diffusion are considered in Ch. 1. Research to date on diffusion in one, two and 3-dimensions, aerodynamic profiles, direct measurements of eddy fluctuations, energy balance method and its application to problems of evaporation and climatology, agriculture, water supply, irrigation, sea water and saline pond evaporation are treated in Ch. 2. Ch. 3 goes thoroughly into diffusion problems connected with atmospheric pollution, single source and stack source diffusion, effective stack height, multiple source diffusion, effect of meteorological parameters, smog, surveys in urban areas and adds a few notes on future research needs. A reference list of approximately 200 items, without titles, is appended. *Subject Headings:* **1. Turbulent diffusion reviews 2. Turbulent diffusion bibliographies 3. Turbulent diffusion effects on atmospheric pollution.**—*M.R.*

10.10–23 551.557:551.554(73)

Ratner, Benjamin (*Off. of Climat., U.S.W.B., Wash., D. C.*), **Upper-air climatology of the United States, Pt. 3, Vector winds and shear.** *U. S. Weather Bureau, Technical Paper,* No. 32,

an. 1959. 67 p. fig., 58 charts, 3 refs. **DWB**—In order to eliminate the bias in data on upper air wind frequencies at high levels where low angles make high wind speed measurements difficult, or impossible, the Office of Climatology at the U. S. W. B. has punched cards for March 1951 to Feb. 1956 for 51 stations in the U. S. for 13 pressure surfaces from 950 to 30 mb for 1500 GMT and has filled in missing records by use of geostrophic winds and interpolated values (both in time and space). Charts of mean vector wind and isotachs for each of the four seasons are presented for 500, 300, surface of maximum speed, 100, 50 and 30 mb levels, along with standard vector deviations, supplemented by 2 charts giving vertical wind profiles for 12 stations (including 3 Alaskan stations) and 32 charts giving average seasonal vector wind shears for 700–500, 400–300, 300–250, 250–200, 200–150, 150–100, 100–80 and 80–50 mb. *Subject Headings:* **1. High level wind summaries 2. Mean vector wind charts 3. Vertical wind shear 4. Upper air wind profiles 5. United States.**—*M.R.*

10.10–24 551.509.31 (02) (98)

†Reed, Richard J., **Arctic weather analysis and forecasting.** Washington (State). Univ. Dept. of Meteorology and Climatology, Contract AF 19(604)-3063, Scientific Report, No. 2 (Occasional Report, No. 11), Jan. **1959.** 119 p. 36 figs., 4 tables, 63 refs., eq. **DWB** (M(055) W319sc)—An attempt at compiling a manual for the Arctic forecaster, giving background information on the workings of the polar atmosphere; structure of Arctic weather systems (frontal systems, jet streams, tropopause, cold lows, surface inversions, etc.), Arctic synoptic (surface and upper air) analysis, and Arctic forecasting; wind and wind forecasting; minimum temperature prediction; cloud and ceiling forecasts; precipitation and snow forecasting; visibility, fog, ice fog, whiteout, blowing snow and, finally, turbulence and icing and their prediction. Examples of synoptic charts, soundings, nomograms, prediction diagrams, illustrative tables are included. *Subject Headings:* **1. Arctic synoptic analysis 2. Arctic weather forecasting 3. Forecasting Arctic Manuals.**—*M.R.*

10.10–25 551.525:551.506

†*Chang, Jen-hu, **Ground temperature.** Blue Hill Meteorological Observatory, Contract DA 19-129-QM-348, (Unnumbered Report), June 21, **1958.** 2 vol. (Vol. 1, 300 p. 132 figs. (some fold.), 62 tables, bibliog. at end of each ch. (413 refs.). Supplementary bibliog. of articles not cited in text, p. 273–300 (402 refs.), eqs. Vol. 2, 196 p. entirely tables.) **DWB**—An unusually thorough 2 volume report giving in tables, charts, graphs, maps, etc. the results of 3 years of work compiling and analyzing information and data on ground temperatures throughout the world, their measurement, analysis and effects. Ch. I emphasizes the importance of ground temperatures, available data, station location chart for world, and the store of literature (>600 articles or reports). Ch. II takes up instruments and measurements; Ch. III, thermal properties of ground and various covers; Ch. IV, heat flux in ground; Ch. V, temperature distribution in ground; VI, factors determining ground temperature; VII, ground frost; VIII, effect of ground temperature on air temperature and IX, methods of modifying ground temperatures. Vol. II contains mean monthly and annual ground temperatures for >800 stations arranged by continents, country and alphabetically by station within each country. An excellent unexcelled bibliography is appended. *Subject Headings:* **1. Ground temperature survey of world 2. Ground temperature data.**—*M.R.*

10.10–26 551.501.75:551.557:016

†Hudson, G. E.; Weisbrod, S.; Heritage, J. L. and Zane, J., **Study of high-altitude wind research, Pt. 1, Methods and bibliography.** Smyth Research Associates, San Diego, Calif., Contract Noas-56-1009-c, Final Technical Report, June 12, **1956.** 99 p. 13 figs., 3 tables, bibliog. p. 70–99. **DWB** (M57 S668st)—Various methods for investigating high altitude winds are reviewed and illustrated. Limitations of these methods are discussed and general conclusions regarding high altitude winds are summarized. A comprehensive bibliography with 247 entries has been compiled and classified according to basic types of investigation techniques. *Subject Headings:* **1. Upper air wind measurement techniques 2. Upper air wind bibliographies.**—*N.N.*

10.10–27 551.525.5:551.524.37(434.1)

*†Schmid, J., **Der Bodenfrost als morphologischer Faktor.** [Soil frost as a morphological factor.] Heidelberg, Dr. Alfred Hüthig Verlag, **1955.** 144 p. 22 figs., 2 tables, bibliog. p. 139–144. Price: DM15. **DLC** (QE581.S36). Review by F. Steinhauser in *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 7(2):303–304, **1956.**—A technical or analytic approach to the problem of ground or soil freezing based mainly on quantitative data obtained by engineers and scientists during the last 2 or 3 decades is evident in this text. Methods of measurement, processes involved in ice formation and frost heaving and mechanics of frost heaving, effect on slopes in humid regions, in different weather conditions in fields, forests, on roads, in different kinds of soil (sand, loam, silt, clay), diurnal variations (based on data at Mainz-Kastel, 1952/53) in connection with air temperature and precipitation, soil moisture, block movements, rock transport, tree movements on slopes and prevention of movement by trees, glacial morphology, solifluction, etc. Effect of snow cover, hoar frost, ice crystals formed in or on soil, of depth of freezing, length of frost period, and many other aspects are considered. *Subject Headings:* **1. Soil freezing 2. Frost heaving 3. Solifluction 4. Mainz-Kastel, Germany.**—*M.R.*

10.10–28 532.52:551.511

Thompson, Philip Duncan, **Statistical-hydrodynamical theory of turbulent flow between smooth parallel walls.** Wash., D. C., Joint Numerical Weather Prediction Unit, Oct. 21, **1957.** 53 p. 4 figs., 17 refs., 53 eqs. **DWB** (532.5 T475st)—A theory of "de-randomization" of eddies is developed and its key result is presented in an equation which relates the change in eddy momentum transport to the average motion and to certain stable statistics of the eddy velocity field. This equation implies that, owing to the interaction between an average shearing motion and a quasi-random eddy motion, an initially random eddy velocity field cannot remain random, but becomes organized in such a way that the axes of the eddies have a preferred "tilt." The theory applies over all ranges of the Reynolds number, throughout the laminar regime across the transition range, and well into the regime of fully developed turbulence. There appears to be no major mathematical difficulty in extending the methods developed here to deal with turbulent flow past a single boundary or with flow between rough walls. *Subject Headings:* **1. Hydrodynamic theories 2. Turbulent flow between walls 3. Turbulent transfer of momentum.**—*From author's summary.*

10.10–29 551.577.2:551.588.2(47)

†Sharova, V. Ia., **Chislo dneĭ s osadkami razlichnoĭ velichiny na territorii Evropeĭskoĭ chasti SSSR i Kavkaza.** [The number of days with various amounts of precipitation in European U.S.S.R. and in the Caucasus.] Ed. by O. A. Drozdov. Leningrad, Gidrometeoizdat, **1958.** 144 p. 77 figs. (incl. 42 maps), 60 refs. At head of t.-p.: Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby pri Sovete Ministrov SSSR, Glavnaia Geofizicheskaia Observatoriia. **DN-HO** (QC925.4 R9L5)—While the main presentation in this major work is a series of isoline charts showing the mean number of days with precipitation $\geq$0.1, 1, 5, 10 mm (monthly and annual maps for $\geq$0.1 mm, mid-season months for the other amounts), there is a great deal else that is potentially useful. Of special significance are the results of a number of subsidiary investigations which serve to establish certain relationships: these include the number of days with precipitation and the amount of precipitation, number of days and elevation (south and north slopes of Caucasus Mountains, east and west slopes of Urals), precipitation and wind direction, and the probability of rainless periods of various durations related to precipitation amount. The monograph begins with a survey of past literature on the distribution of precipitation in the U.S.S.R., and goes on to discuss the homogeneity and quality of the observations, the influence of relief and exposure, and the regional distribution of precipitation days and rainless periods. The isoline charts are based on data for 688 stations, with a substantial number possessing records of at least 30 years. Data for the basic period 1891–1935 were drawn from the series of climatological handbooks of the U.S.S.R. prepared in the last 15 years or so, and these were supplemented by shorter records in the period 1930–48 for certain isolated and mountain regions. These data are not reproduced in tabular form in this monograph, although other data of value, for selected stations, are shown, including the frequency of

years with various values of the number of precipitation days in each month (34 stations), and the mean and maximum number of rainless periods of various durations (17 stations). *Subject Headings:* **1. Precipitation distribution, U.S.S.R. 2. Topographic effects on rainfall 3. European U.S.S.R. 4. Caucasus. I. Drozdov, O. A.** (ed.).—*R. S. Quiroz.*

10.10–30 551.573:551.574.41

†Fuks, N. A., **Isparenie i rost kapel' v gazoobraznoĭ srede.** [Evaporation and growth of drops in a gaseous medium.] *Akademiia Nauk SSSR, Itogi Nauki, Fiziko-Matematicheskie Nauki*, 1, **1958.** 89 p. 18 figs., 88 refs., eqs. Recto of half-title page: Akademiia Nauk SSSR, Vsesoiuznyĭ Institut Nauchno-Tekhnicheskoĭ Informatsii.—This is a review of existing theories and experimental work dealing with evaporation and growth of drops in a gaseous medium. The main part deals with the problem of quasi-stationary processes of drops—evaporation and heat transfer at which the speed of the process at any moment is equal to the speed of the stationary process with bordering conditions existing at the given moment. Ch. 1 deals with the simplest case of evaporation of fixed drops, as regards to medium, when the influence of the hydrodynamic factor is excluded. Ch. 2 covers the quasi-stationary evaporation of drops in a gas flow, i.e., to drops moving with respect to the medium. Ch. 3 discusses several cases of nonstationary drop evaporation. Special attention has been given to the agreement of theory with experimental data. *Subject Headings:* **1. Evaporation of droplets 2. Drop growth.**—*A.M.P.*

10.10–31 551.513.1:551.571

†Peixoto, José Pinto (*Serviço Met. Nacional da Faculdade de Ciências da Univers. Lisboa*), **Contribuição para o estudo da energética da circulação geral da Atmosfers.** [Energetics of the general circulation of the atmosphere.] *Lisboa. Universidade. Faculdade de Ciências, Revista*, Ser. 2, Section B, 6:53–235, **1956/1958.** 22 figs., tables, 94 refs., numerous eqs. English summary p. 220–223.—A major review of most of the current knowledge on the theory of the general circulation with specific analysis of the data for the Northern Hemisphere for 2 seasons (summer and winter) of 1950. Turbulent exchange of water vapor from the sea to the atmosphere and on a planetary scale within the atmosphere using a fairly dense network of 90 radiosonde stations for 1000, 850, 700, 500 and 400 mb; actual mean values of precipitable water for 1950 and for summer and winter of 1950; profiles of specific humidity for 0° to 70°N and 1000–500 mi and standard deviations of same; mean meridional flux of water vapor and variations with altitude; mean zonal flux of water vapor and variations; total flux associated with perturbations; autocorrelations with space divergence field associated with water vapor flux and, finally, the portion of the energy cycle attributed to vapor transport are treated theoretically and with numerous charts and cross sections. *Subject Headings:* **1. General circulation energetics 2. Water vapor transport 3. Northern Hemisphere.**—*M. R.*

10.10–32 551.573 551.582.3(62, 56)

†*Thornthwaite, Charles W.; Mather, J. R. and Carter, Douglas B., **Three water balance maps of Southwest Asia.** *Drexel Institute of Technology. Laboratory of Climatology, Publications in Climatology*, 11(1); **1958.** 57 p. 3 figs., tables, 61 refs. **DWB** (M8 D777p V. 11 No. 1)—Report gives history, methods of measuring evapotranspiration, of determining potential evapotranspiration, of computing water balance, of constructing the maps of Ethiopia, Greece, Egypt, Sudan, Turkey, Bulgaria, Arabia, Iraq, Iran, Jordan, Israel, Lebanon, Syria, Afghanistan, Pakistan and Soviet Central Asia (using data from 400 stations). Moisture flux and energy budget methods have been used to determine evapotranspiration, but moisture balance and actual measurements from soil filled tanks are more often used. THORNTHWAITE'S formula for computing the water balance is used, including description of methods and interpretation of computation and of cartography, examples for Tartous and Palmyra, Syria for each month and for the year (given in tables and graphs), and extensive comments on the distribution of potential evapotranspiration, of mean annual water deficit, and of water surplus and on the water cycle in the Nile Basin. Appended is an evaluation by DOUGLAS B. CARTER of the alternate methods of estimating potential evapotranspiration (the PENMAN, and the BLANEY-CRIDDLE methods); geographical coordinates of stations in S.W. Asia used in the maps

and the 3 large folded color maps of mean annual water surplus, water deficit, and potential evapotranspiration, respectively, for the two major areas: the Red Sea, and the Persian Gulf and their respective environs. The MILLER composite projection (bi-polar oblique conic conformal projection) with scale 1:5,000,000 is used. Seasonal water balance graphs are shown for each of 9 selected stations. The maps have been published as samples of projection format and techniques for a World Climatic Atlas (under Contract with UNESCO and in partial compliance with specifications of the WMO Working Group in Climatic Atlases, 1957). *Subject Headings:* **1. Water balance charts, Southwest Asia 2. Potential evapotranspiration charts 3. World climatic atlases 4. Egypt 5. Southwest Asia.**—*M.R.*

POPULAR METEOROLOGY

See also: **The Arctic** (Machowski), 10.10–53; **The 6th continent** (Suziumov), 10.10–56.

10.10–33 551.543:525.6 551.510.535

Defant, Albert, **Ebb and flow: the tides of earth, air, and water.** Ann Arbor, Univ. of Michigan Press, **1958.** 121 p. 64 figs., 8 tables. **DWB** (525.6 D313eE). Trans. by A. J. Pomerans of original German, **Ebbe und Flut des Meeres der Atmosphäre und der Erdfeste.** pub. Berlin, Springer Verlag, **1953** (*see* 5.1–188, Jan. 1954, *MAB*).—Nature and cause of tides, shore tide gages and measurement of tides at sea, tidal currents and current meters, gravimeters, tidal theory, harmonic analysis, prediction, records, tide prediction machines, seiches, tides in seas, bays and channels, rotational and frictional forces, tides in specific seas and in the ocean, in river estuaries, internal waves and tides, atmospheric tides, ionospheric tides and, finally, tides in the earth's crust are discussed in a nontechnical manner, but with many illustrations from technical literature or records. Although this is a translation, it is as easily read as any original English book and is on a unique subject. *Subject Headings:* **1. Tides 2. Atmospheric tides 3. Ionospheric tides.**—*M.R.*

10.10–34 797.55 551.576:629.13:551.558.1

Gotch, Arthur Frederick, **Playground in the sky.** London, Hutchinson, **1955.** 151 p. 25 figs., 34 photos. **DLC** (TL760.G6). Review by Ann Welch in *Weather*, London, 10(9):314–315, Sept. **1955.**—An authoritative, but popular, book on gliding in all of its ramifications, including a great deal about thermals, clouds and cloud flying (Ch. VI), flying with an engine, cross country flying, aerobatics, principles of aeronautics, a discussion and list of British and other gliding clubs. The principles of aerodynamics, of gliding and of thermals are adequately explained but an unusually thorough exposition is given of clouds and cloud flying, and of instrumentation for gliding. *Subject Headings:* **1. Gliding 2. Cloud flying.**—*M.R.*

10.10–35 551.5:614.8

†Hewitt, R., **From earthquake, fire and flood.** N. Y., Charles Scribner's Sons, **1957.** 215 p. 15 plates (photos), 53 refs. **DWB** (904 H611fr)—A popular book vividly recounting and illustrating the effects of natural agents of disaster such as volcanic eruptions, earthquakes, comets, meteorites, tidal waves, lightning, floods, tropical storms, wind and rain, thunderstorms, famines, fires, drought, fog, epidemics, etc. The approach is meteorological but the style literary and historical. Appended are a glossary, a bibliography and index. Tables of statistics of loss of life and property damage are included for several of the types of disaster. *Subject Headings:* **1. Disaster accounts 2. Natural disasters.**—*M.R.*

10.10–36 551.515.3:614.8(764)

Moore, Harry Estill, **Tornadoes over Texas: a study of Waco and San Angelo in disaster.** Austin, Univ. of Texas Press, **1958.** 334 p. 12 figs., 67 tables, numerous foot-refs. **DWB** (M15.3M822to)—A complete sociological study of the results of the disaster that struck Waco and San Angelo, Texas, May 11, 1953 and especially of the disruption of the community and family patterns and the subsequent heroism and activity which closely parallel the results of wartime bombing. A map of downtown Waco shows locations of damaged buildings and extent of damage. Total loss was about $50,000,000. The funnel travelled for five miles from

southwest to northeast about 20 ft above the ground, wrecking 2 sq mi of business structures but damage would have been much worse had the funnel reached the street level. Concrete and steel buildings were only slightly damaged but brick buildings collapsed completely. Control of traffic and restoration of communications were the most difficult tasks. A similar situation in San Angelo a year later was studied for effects on population. Many personal interviews are reported. *Subject Headings:* **1. Tornadoes, Waco and San Angelo, Texas (May 11, 1953) 2. Tornado disaster effects. 3. Texas.**—*M.R.*

MANUALS, ATLASES AND HANDBOOKS

See also: **Forecasting manuals** (Reed), 10.10–24; **Aeronautical met. manuals** (Pchelko), 10.10–101.

10.10–37 551.574.1:535.4

†Volz, F. (*Mainz*), **Optik der Tropfen, Abschnitt 1, Optik des Dunstes.** [Optics of drops, Pt. 1, Optics of haze.] *Handbuch der Geophysik*, Berlin, 8:822–897, pub. **1956.** 30 figs., 9 tables, 144 refs., 16 eqs. **DWB**—Pt. 1 of Ch. 14 is a comprehensive review of knowledge of the optics of atmospheric aerosol and includes both the methods and results of theoretical and experimental investigations. The review covers the following: the size, distribution, state, chemistry and origin of atmospheric aerosol and factors influencing size distribution, such as fall velocity, moisture, increase of nuclei, etc.; scattering and attenuation of light by Mie-particles including theories of light scattering and the results obtained by their use; attenuation and scattering of real aerosol and light attenuation of absorbing aerosol; optical relationships in the case of different size distributions of aerosol including optical properties (extinction and scattering) for a Gauss function of size distribution, for a power function of size distribution and for aerosol size distribution deviating from a power function; also the theory of radiation distribution in the sky and the effect of multiple reflection and albedo of the earth's surface upon radiation distribution in the sky; the results of measurements of spectral extinction by haze, fog and smoke. The review also contains a detailed consideration of spectral extinction by haze and fog, anomalous extinction in the case of atmospheric turbidities, and a comparison between scattering and absorption capacity of aerosols; the results of measurement of scattered light by atmospheric aerosol and by smoke including scattering function of the light of the sky; scattering function of searchlights of aerosol near the ground and experimental measurements of scattering functions of smoke turbidity such as blue sun; the optics and meteorology of types of haze light involving the measurements and observations in lowland and highlands on scattering functions of a turbidity type characteristic of pure cold air, haze turbidity type (termed stratus cloud type observable usually after the dissolution of stratus clouds and fog), the haze-Bishop ring; the size distribution of the aerosol and refractive index of the various turbidity types; frequency and meteorological features of turbidity types; searchlight scattering function and types of light of the sky; observation and theory of the color of the haze sky; angular width of scattered light discs as a function of solar elevation; optics of height distribution of aerosol and purple light; scattered light at the edge of the sun; and scattering function of divergent light. *Subject Headings:* **1. Aerosols 2. Scattering of light 3. Optics of drops.**—*I.L.D.*

10.10–38 551.593.1

Meyer, R., **Atmosphärische Strahlenbrechung.** [Atmospheric refraction.] *Handbuch der Geophysik*, Berlin, 8:769–821, pub. **1955–1956.** numerous foot-refs., figs., eqs. (p. 769–786 of this monograph appeared in Vol. 8, "Lieferung" 4, pub. **1955** and p. 787–821 in "Lieferung" 5, pub. 1956; (for abstract on p. 769–786, *see* 7.1–335, Jan. 1956, *MAB*). The work is now concluded in this "Lieferung" 5, p. 787–821, pub. **1956.** The two installments constitute Ch. 13 of Vol. 8. **DWB.** Review by L. Foitzik in *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 32(1/2):124–125, **1959.**—The review of contemporary knowledge of atmospheric refraction contains a discussion of scintillation phenomena in the atmosphere, the magnitude of atmospheric shimmer, and determination of the distance from the observer, the apparent twinkling of the fixed stars, the rapid alteration of brightness of fixed stars and its relation to twinkling; color change during the scintillation of fixed stars; the theory of astronomical atmospheric re-

flection; the physical basis of the "green flash" and the conditions of its occurrence; norma terrestrial refraction, including a climatology of refraction; the change of horizon dip and dis tance by radiation refraction and their measurement; disturbances of terrestrial refraction b horizontal temperature gradients; "trembling of the air," etc.; terrestrial atmospheric reflec tions, including both upper and lower reflections, etc. *Subject Heading:* **1. Atmospheric refrac tion.**—*I.L.D.*

10.10–39 551.510.721 (02

U. S. Air Weather Service, **Radioactivity fall-out plots.** Its *AWS Manual*, 105-33, Jun **1956.** 39 p. 8 figs., tables. **DWB** (M(055) U57am)—This manual contains detailed in structions for procedures to be followed in determining areas of possible fallout danger on th basis of fallout wind data furnished by the U. S. Weather Bureau. The manual supersede the 1954 edition which contained basically the same instructions (for a more detailed abstrac on that edition, *see* 7.4–294, April 1956, *MAB*). *Subject Headings:* **1. Radioactive fallou calculation manuals 2. Radioactivity in the atmosphere.**—*G.T.*

10.10–40 551.501.1 (02

U. S. Weather Bureau, **Instructions for climatological observers.** Its *Circular B.*, 10th ed rev. Oct. **1955.** 70 p. figs. (incl. photos). **DWB** (M01.1 U587c)—General and specifi instructions for observation, recording, administration, installation and maintenance o equipment, etc. at climatological stations (of which there are >7500 with volunteer observer and 1800 other persons and agencies cooperating in the U. S. and dependencies) supervised b the U. S. Weather Bureau. The separate chapters take up: 1) General, 2) Temperature 3) Precipitation, 4) Evaporation, 5) Atmospheric phenomena (tornadoes, thunderstorms, win storms, hydrometeors, litho-, igneous-, and luminous-meteors, and earthquakes). The Circula combines *Circulars B*, *C* and *L* which were issued at various times from 1892–1950. (For 10t ed., *see* 5.10–25, Oct. 1954, *MAB*.) *Subject Headings:* **1. Observers manuals 2. Climatologica observer's instructions 3. Evaporation networks.**—*M.R.*

10.10–41 551.509.1 :551.508.822 (02

U. S. Weather Bureau, **Manual for radiosonde code (WBAN).** First ed. Wash., D. C. U. S. Govt. Print. Off., Feb. 1, **1956.** 55 p. fig. (fold.) loose-leaf. **DWB** (M09.1 U587rbm)— The IMO code of 1949 was superseded by the WMO code of 1955. This code allows som latitude for variations between continents and even individual countries but basically the in structions promulgated in this coding manual will apply universally. Those local differences which are permitted are set forth in Pt. III (codes used in Region I, II, III, V and VI). Th basic codes are elaborated in Part I, and the codes used in Region IV (N. and Central America in Pt. II. Special codes for upper air data are included as well as the basic code. The manua is obligatory for all U. S. Weather Bureau, Air Weather Service and Naval Aerology report from upper air, land and ship radiosondes and rawinsonde stations in N. America and adjacen oceans. *Subject Headings:* **1. Radiosonde code manuals. I. U. S. Air Weather Servic II. U. S. Navy. Naval Aerology Branch.**—*M.R.*

10.10–42 551.501.1 (075

U. S. Weather Bureau, **Basic supervision.** Its *Training Paper*, No. 11, Nov. **1954** Consists of 9 Parts, each separately paged. figs., forms, refs. Contents: Pt. 1, **The job o supervising.** 14 p. Pt. 2, **The supervisor as a leader.** 19 p. Pt. 3, **Getting along wit others.** 25 p. Pt. 4, **Rating employees.** 19 p. Pt. 5, **The supervisor as an instructor.** 27 p Pt. 6, **Effective utilization of employees.** 26 p. Pt. 7, **Improving work methods.** 27 p. Pt 8, **Conducting meetings.** 35 p. Pt. 9, **The supervisor's part in management.** 28 p. **DWB** (M01.1 U587tr)—Brief illustrated random notes on various aspects of the role of the weathe station supervisor as a "straw boss" or a leader who must be in direct contact with his sub ordinates and must carry out the policies handed down from above. In the introduction Dr. F. W. REICHELDERFER stresses the importance of technical competence and leadership over th more administrative type of leadership desired in other spheres. The present manual is aime at helping supervisors to improve their relationships and competence. *Subject Heading* **1. Weather station supervision 2. Training manuals.**—*M.R.*

10.10–43 551.501.1(02)

U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby, **Nastavlenie gidrometeorologicheskim stantsiiam i postam, vypusk 10, Inspektsiia gidrometeorologicheskikh stantsiĭ i postov, chast' 1, Inspektsiia meteorologicheskikh nabliudeniĭ na stantsiiakh.** [Instructions for hydrometeorological stations and posts, Vol. 10, Inspection of hydrometeorological stations and posts, Pt. 1, Inspection of meteorological observations at stations.] Leningrad, Gidrometeoizdat, **1957.** 193 p. 62 figs., tables. **DWB** (M01.1 U584na)—Systematic instructions for inspection of regular meteorological stations for the purpose of achieving uniformity and comparability of observations, accuracy in reports for economy, efficiency in operation, and high quality of technical work. Inspections are of two types: 1) systematic or regular and 2) emergency or special. Regular inspections are to be made once a year for most types of stations, though well run stations need inspection only once in 3 years. Graphic methods are used to determine whether or not systematic errors are being made in observing any of the elements. Many examples of statistical verification are presented. After considering general aspects of inspection, the verification of instruments and observations of separate elements are considered: pressure, temp., humidity, precip., snow cover, wind direction and speed, pibals, cloudiness, sunshine, visibility, atmospheric phenomena, icing, soil temperature, agrometeorological observations, etc. Appended are tables and nomograms to aid in calculations (reduction of pressure to sea level, measurement of small angles, correction of barometer for gravity, ice measurement, etc.). Forms of reporting on inspection are also presented and discussed. *Subject Headings:* **1. Observers manuals 2. Hydrometeorology observation manuals.**—*M.R.*

NEW SERIALS

10.10–44 551.506.22(05)

U. S. Office of Technical Services, **Soviet Bloc International Geophysical Year Information,** Feb. 14, 1958–Jan. 2, 1959. Weekly. Price for projected series, to non-government scientists, $10.00 from Office of Technical Services (order its PB 131-632). **DWB.** See *Science,* 127(3300):689, March 28, **1958.** Also: *Journal of Geophysical Research,* 63(2):424, June **1958.**—This weekly bulletin gives summaries of activities and scientific results reported in Soviet Bloc journals and newspapers regarding IGY observations and expeditions in Eurasia or the Arctic and Antarctic, in fields of geomagnetism, oceanography, meteorology, aerology, rockets and satellites, glaciology, geodesy and astrophysics, etc. *Subject Headings:* **1. Soviet Bloc IGY Information 2. IGY program 3. Serial publications.**—*M.R.*

10.10–45 551.506:551.510.535:550.38:551.521.64

Saikó, János, **Új szovjet kiadvány.** [A new Soviet publication.] *Időjárás,* Budapest, 62(3):178, May/June **1958. DLC**—New serial: **Cosmic Data** published by Nizmir Observatory (near Moscow) since January 1958. Monthly. Contains data on ionosphere, geomagnetism, cosmic rays and telluric currents for several stations. *Subject Headings:* **1. Data publications 2. Cosmic ray periodicals.**—*G.T.*

10.10–46 551.5(05) 550.3:061.3(82)

Instituto Antartico Argentino, Buenos Aires, **Boletín,** Vol. 1, No. 1, May **1957.** Latest issue seen, 1(2), Nov. **1957.** No. 1, 48 p. No. 2, 40 p. Irregular. Director of the Institute, Rodolfo N. Panzarini. Subscription (2 numbers per year), $10.00 (pesos). Regular feature, **Bibliografia Polar** [Polar bibliography]. **DWB**—A news bulletin, with short illustrated articles in Spanish, giving information regarding projects and personnel engaged in Antarctic research or expeditions; IGY projects and activities of Argentina, U. S. and other countries; high altitude observatories in South America (e.g. on Aconcagua at 6,800 m elevation to be established in spring 1958); obituaries of Admiral Byrd, Lord Mountevans, H. U. Sverdrup; a short Antarctic and Arctic (title) bibliography (3 pages); and a calendar of coming meetings and events. *Subject Headings:* **1. Serial publications 2. IGY program 3. Argentine participation in IGY. I. Panzarini, Rodolfo N.**—*M.R.*

TRANSLATIONS

See: **Physical and dynamic met.** (Brunt), 10.10–12; **Tides** (Defant), 10.10–33; **The 6th continent** (Suziumov), 10.10–56; **Thunderstorm flights** (Kogan-Beletskiĭ), 10.10–98; **Ionosphere** (Al'pert), 10.10–201; **Cold air movements,China** (Yeh et al.), 10.10–238; **Planetary frontal zone** (Zubian), 10.10–240.

GENERAL GEOPHYSICS AND METEOROLOGY

IGY

See also: **IGY collected papers,** 10.10–1; **Soviet Bloc IGY Information,** 10.10–44; **Soviet Antarc. IGY expeditions** (Suziumov), 10.10–56; **IGY Antarc. glaciology program** (Imbert), 10.10–57.

10.10–47 551.506.22:551.46

Kort, V. G., **Okeanograficheskie issledovaniia.** [Oceanographic research.] *Akademiia Nauk SSSR. Mezhduvedomstvennyĭ Komitet po Provedeniiu Mezhdunarodnogo Geofizicheskogo Goda, Informatsionnyĭ Biulleten'*, No. 3:37–54, **1957.** 2 figs., 2 tables. **DLC.** Transl. into English available for ref. **DWB** (551.46 K85oc). 31 p. figs., tables. Photostat of typescript.—The final IGY program of oceanographic investigations adopted at the conference of Göteborg is discussed as regards to the proposed studies and the methods of their investigation. An important feature of these studies will be the simultaneous observations on the whole expanse of the World Ocean. The distribution of the more than 70 oceanographic vessels during the IGY is presented on two maps, one for foreign, the other for Soviet ships. Methods of preliminary processing and forwarding of data to IGY data centers according to forms recommended by the Organization are also discussed. *Subject Headings:* **1. IGY oceanographic program 2. IGY data center 3. Oceanographic observations.**—*A.M.P.*

10.10–48 551.5:550.3:061.1

Ashford, O. M., **International Geophysical Year.** *World Meteorological Organization, WMO Bulletin*, 8(2):60–61, April **1959.** photo. **DWB**—Work of collecting and publishing meteorological observations will not be completed until end of 1959. By mid-March 1959 more than 20 countries had sent all their standard forms to IGY data center of WMO Secretariat. Over 1500 microcards have been distributed to each subscriber, representing about 100,000 standard forms or 10% of total volume to be published. The first batch of microcards was distributed before end of IGY (Dec. 31, 1958). *Subject Headings:* **1. IGY data center 2. WMO-IGY data center 3. Microcard program of WMO.**—*M.R.*

10.10–49 551.506.22

Buedeler, Werner, **The International Geophysical Year.** Paris, UNESCO, **1957.** 71 p. figs., photos. Price: 3 sh. (*UNESCO and its Programme*, No. XV.) **DWB** (551.06 B928in). Review in *Science Progress*, London, 46(181):180–181, Jan. **1958.**—A nicely illustrated pamphlet giving the highlights of IGY from the point of view of the part UNESCO has played in it. The earth, geophysics, the two Polar Years, the scope of IGY and work of CSAGI, atmospheric studies, aurora and airglow, ionosphere, space flight, solar research, geodesy, glaciology and geomagnetism, Antarctic explorations and the future (after IGY) are the subjects of the 11 chapters. A short technical glossary is appended. *Subject Headings:* **1. IGY program 2. UNESCO participation in IGY.**—*M.R.*

10.10–50 551.311.1:551.506.22

Bader, Henri, **United States polar ice and snow studies in the International Geophysical Year.** *American Geophysical Union, Geophysical Monograph*, No. 2:177–181, **1958.** 5 figs., 2 refs. **DLC**—The behavior of glaciers under conditions of warming or cooling climate and increasing or decreasing snowfall, and the physics and dynamics of temperate and polar glaciers are discussed. The studies on the Greenland and the Antarctic ice sheet beginning with the work of SORGE (1931) on annual snow layers, the establishment of Sorge's Law, the work of

SIPRE and of others on distinguishing summer and winter snow layers in Greenland and the Antarctic by the ratio of oxygen 16 and 18 isotopes, the determination of the age of snow layers by the tritium content method and the coring program in the U. S. IGY general program carried out by SIPRE are described. The coring procedure, and the coring apparatus (illustrated by photographs) are described and graphs showing change of snow density with depth on the Greenland inland ice, five year running mean of annual accumulation of snow 200 mi east of Thule, etc. are presented. *Subject Headings:* **1. IGY glaciological program 2. Snow research 3. Polar ice.**—*I.L.D.*

WMO

See also: **Reports of session of WMO Agromet. Comm.**, 10.10–5; **Report of working group of WMO Aerology Comm.** (Priestley et al.), 10.10–22; **WMO-IGY data center** (Ashford), 10.10–48.

10.10–51 551.5:061.1

Third World Meteorological Congress: a review of the main questions to be discussed. *World Meteorological Organization, WMO Bulletin*, 8(2):52–58, April **1959.** 2 photos. **DWB**—Advance summary of the main problems facing the third WMO Congress, April 1–28, 1959: WMO Convention amendments, joint support of meteorological projects by 2 or more countries, relations with other United Nations agencies, technical assistance, technical activities of WMO and of technical commissions, Hydrological commission, arid zone and humid tropics programs, IGY, atomic energy uses, technical regulations, publications (including World Meteorology Bibliography), artificial satellites and WMO's role in study of outer atmosphere, administrative and financial regulations, new building (now started), etc. *Subject Heading:* **1. WMO. Congresses.**—*M.R.*

10.10–52 551.5:061.1(71/73)

World Meteorological Organization. Regional Association IV (North and Central America), **Abridged final report of the Second Session, Washington, Dec. 1–6, 1958.** *World Meteorological Organization, WMO [Publication]*, No. 85. RP. 36, **1959.** 58 p. **DWB** (M(06) W927p)—A standard "abridged" report of the RA IV held at the State Department Conference Suite in Washington, D. C., Dec. 1–6, 1958, with Andrew Thomson of Canada presiding. The agenda is given, representatives of 9 members of RAIV, of 4 other members of WMO, of 7 international organizations, the secretariat, etc., are listed and a general summary of the work of the session. Fifteen (15) resolutions, 3 recommendations, and a list of stations and their call numbers, and programs for surface and upper air observations in Region IV, plus a list of 54 documents presented at the conference. F. W. REICHELDERFER was unanimously elected President and A. BRUINENBERG, Vice President, and W. A. GRINSTED, Chairman of the Eastern Caribbean Hurricane Committee. *Subject Headings:* **1. WMO. Regional Assoc. meetings 2. WMO. Regional Association IV (North and Central America).**—*M.R.*

ARCTIC RESEARCH

See also: **Arctic synoptic analysis** (Reed), 10.10–24; **Arctic flying** (Comet), 10.10–100; **Arctic flying** (Wood, Gleason), 10.10–105.

10.10–53 551.582.1(98)

†Machowski, Jacek, **Arktyka.** [The Arctic.] Warsaw, Wiedza Powszechna, **1955.** 266 p. figs., photos, tables, 57 refs. p. 220–222. **DWB** (919.8 M151ar)—A popular book on the Arctic containing ample information on: the history of its gradual conquest by man and the knowledge of Arctic conditions acquired by explorers and scientists of various countries. Special attention is given to Soviet efforts in the study of the Arctic, and the outstanding results obtained by Soviet explorers and scientists in that field. Some information on the climate is given on p. 72–77. References are to popular books and articles on Arctic life and science, from various countries (1930–1953). *Subject Headings:* **1. Arctic research 2. Climate of Arctic 3. Arctic.**—*A.M.P.*

10.10–54 551.311.181(268):061.3

Avsiuk, G. A., **Mezhdunarodnaia konferentsiia po morskim arkticheskim l'dam, proiskh- odivshaia v 1958 godu v SSHA.** [International Conference on Arctic Sea Ice in the U. S. in 1958.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geog.*, No. 5:128–130, Sept./Oct. **1958.** **DWB**—From Feb. 24–27, 1958 an International Conference on Arctic Sea Ice was held in Easton, Md., under the auspices of the National Academy of Sciences of the U. S. The purpose of the conference was to widen the exchange of data and ideas among scientists engaged in studying Arctic ice and to aid the IGY program devoted to observations on sea ice. Twenty-eight papers were delivered; seven by Soviet scientists. The subjects discussed at the conference included the following: (1) distribution and properties of ice; (2) methods of observation and study of ice; (3) physical and mechanical properties of ice; (4) problems of formation, growth and disintegration of ice; (5) drift and deformation of Arctic sea ice; and (6) forecasting condition and distribution of sea ice. The titles of the papers delivered together with the names of the authors are listed and the general value and impressions of the conference are discussed. *Subject Headings:* **1. International Conference on Arctic Sea Ice, Easton, Md., Feb. 24–27, 1958 2. Arctic sea ice 3. Sea ice.**—*I.L.D.*

10.10–55 551.513:551.583(98)

Riccardi, Riccardo, **Le regioni Artiche e i recenti progressi nella loro conoscenza.** [Arctic region and recent progress in its knowledge.] *Società Geografica Italiana, Rome, Bollettino*, Ser. 8, 11(1/3):98–112, Jan./March **1958.** 4 photos, bibliog., p. 111–112. English summary p. 112. **DWB, DLC**—After a short survey of the history of the explorations of the Arctic from ancient times to the second World War, the author deals with the more recent expeditions, particularly Greenland, and with the regular Russian, American and Canadian explorations in the Arctic Sea; he dwells on the development of the so-called Northern Sea-Route, on the floating stations, on the morphology of the bottom of that sea as discovered from the explorations, on the ice islands and their origin, on the theory of PETTERSSEN regarding the Arctic atmospheric circulation, on the climatic fluctuation which took place in the Arctic region recently, and on the economic consequences of warming, especially in Greenland. The author hints at the economic resources of the Arctic Region and at their importance for air navigation. *Subject Headings:* **1. Arctic research 2. Arctic circulation 3. Climatic changes 4. Arctic.**—*Author's summary.*

ANTARCTIC RESEARCH

See also: **German Antarctic Expedition, 1938/1939,** 10.10–8.

10.10–56 551.506.5(99) 551.506.22(99)

Suziumov, Evgeniĭ Matveevich, **K shestomu materiku.** [To the 6th continent.] Moscow, Gos. Izd-vo Geogr. Lit-ry, **1958.** 349 p. photos, map (fold.). **DLC** (G850 1957.S8). Transl. into German by Ursula and Helmut Straubig, with title **Zum sechsten Kontinent,** pub. Leipzig, F. A. Brockhaus, **1958.** 335 p. photos, etc. **DLC** (G850 1957 S815)—Experiences of a member of the "Ob' " expedition from Nov. 30, 1955 to Antarctica in the Antarctic pack ice at Mirny and on subsequent missions to New Zealand, back to the Antarctic, to Australia, the Indian Ocean, Egypt and back to the U.S.S.R., in the summer of 1956. The history of IGY and early bases established by other countries are reviewed in the introductory chapter; the two years of Soviet IGY Antarctic oceanographic and meteorological work (1957–58) is summarized, especially that of the second trip of the "Ob'," in the final chapter (which is only in the German edition). A great deal about weather experience, meteorological and oceanographic work, is found throughout the book. *Subject Headings:* **1. Soviet Antarctic IGY expeditions 2. "Ob' " Expedition, 1955–56 3. Translations 4. Mirny, Antarctica.**—*M.R.*

10.10–57 551.506.22:551.321.6:550.340(99)

Imbert, Bertrand, **Détermination de l'épaisseur de la glace en Terre Adélie.** [Determination of ice depth in Adélie Land.] *Académie des Sciences, Paris, Comptes Rendus*, 248(4):576–579, Jan. 26, **1959.** fig., table, 5 refs. **DWB, DLC**—During the International Geophysical Year, the author carried out a series of measurements of the ice depth on the Antarctic Con-

nent, along a 480 km profile south of the French base at Dumont d'Urville (66°40'S, 140°01'E) in Adélie Land. These measurements were made by the seismic method at 27 stations. The level of the shelf lies on the average at −40 m. The ice surface has an elliptic profile and the friction of ice on the bottom decreases linearly together with the distance to the coast. The elliptic profile could be due to the sharp decrease of accumulation towards the inland, contrarily to what happens in the Greenland area where a parabolic profile is noted. *Subject Headings:* **1. IGY Antarctic glaciology program 2. Ice depth measurement 3. Dumont d'Urville, Adélie Land.**—*A.V.*

10.10–58 551.5(99)

Langlo, K., **Meteorology in the Antarctic: discussions in Australia.** *World Meteorological Organization, WMO Bulletin*, 8(2):75–77, April **1959. DWB**—Notes on problems discussed at the Symposium on Antarctic Meteorology at Melbourne, 18–25 Feb. and of the SCAR (Special Committee on Antarctic Research) on March 2–6, 1959. Among these are: lack of adequate observations (one upper air station is now operating for 1000 km of coast), the penetration of cyclones into the center of the polar plateau, local effects and katabatic winds, contrast of Antarctic and Arctic stratosphere (temperature in winter 30°C colder than Arctic), explosive rather than gradual warming on return of sun in spring, role of ozone in this warming, use of automatic weather stations and floating automatic stations (use of the Grasshopper, the American Automatic station), 800 g radiosonde balloons reaching 35–43.5 km and Antarctic analysis centers to be set up in Australia, publication of meteorological data for research and bibliography and telecommunication problems. *Subject Headings:* **1. Antarctic meteorology problems 2. Antarctic meteorological summaries 3. Antarctica.**—*M.R.*

SERVICES, INSTITUTIONS AND OBSERVATORIES

See also: **Soviet agromet. services, 10.10–5.**

10.10–59 551.58:061.1(497.1)

Jovičić, S., **Deset godina rada klimatološke službe FNRJ.** [Ten years of the work of the Climatological Service of Yugoslavia.] *Yugoslavia. Hidrometeorološka Služba, Vesnik*, 6(1/2):40–43, Jan./June **1957.** 2 tables. **DWB**—The number of stations in the climatological network of Yugoslavia has increased from 370 in 1946 to 2776 in 1957 (43 first order, 80 second, 437 third and 2216 fourth order stations), which is close to the planned total. Climatic data and a series of books on the climate of Yugoslavia are being published. Since 1949 all data of the higher order stations have been recorded on punched cards used with IBM machines. *Subject Headings:* **1. Yugoslav climatological service 2. Climatological services 3. Punched cards 4. Yugoslavia.**—*G.T.*

10.10–60 551.5:061.1(496.5)

Bukhgendler, K., **Gidrometeorologicheskaia sluzhba Albanii na pod'eme.** [The hydrometeorological service of Albania on the rise.] *Meteorologiia i Gidroligiia*, Leningrad, No. 3:68–69, March **1958. DWB, DLC**—The first meteorological station in Albania was established in Durazzo in 1868 but no organized state network was organized until the establishment of the Albanian Peoples Republic. In 1947 the hydrometeorological service was transferred to the army which had military meteorologists who had been trained in Yugoslavia. The Directorate of the Hydrometeorological Service was established in 1949, new stations were established in 1950; by 1957 their number was about 4 times that in 1945. Hydrological observations include that of water temperature, current velocity, load carried by streams, levels of underground water, etc. In addition to the regular climatologic observations, meteorological stations also made aerological observations. Monthly and annual bulletins for the period 1951–1956 have been published. The hydrometric division has issued a bulletin giving data on the characteristics of the rivers and lakes of Albania for the period 1947–1956. In 1957 **Regime of Albanian rivers, Precipitation** and **Temperature regime of Albania** were published. *Subject Headings:* **1. Albanian meteorological service 2. Meteorological service development 3. Albania.**—*I.L.D.*

10.10–61 551.5:061.1(477)

Guk, N. I., **Trudy Kirovogradskoĭ meteorologicheskoĭ seti.** [Works of the Kirovograd meteorological network.] *Kiev, Ukraine. Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, 4-3–10, **1955.** 18 refs. **DWB**—The organization of a meteorological network in the Ukraine was begun in the 1870's with the initiative of G. Ia. Bliznin and R. V. Przhishikhovskiĭ, secondary school teachers in Kirovograd (formerly Elisavetgrad). The history of meteorological observations in the Ukraine, the individuals involved in the development of the Ukraine weather station network, the beginnings of short term forecasting (1877), the type of work done and early research are described briefly. A photograph of Bliznin and a list of the publications of Bliznin and Przhishikhovskiĭ, and of the periodical publications of the Kirovograd meteorological network during the nineteenth century and early twentieth century are presented. *Subject Headings:* **1. Meteorological networks 2. Kirovograd, Ukrainian S.S.R.**—*I.L.D.*

CONFERENCES AND SYMPOSIA

See also: **Ground Water Symposia, New Delhi, 1955,** 10.10–2; **Climatology Symposia, Canberra, 1956** (UNESCO), 10.10–3; **Weather Radar Conf., Miami, 1958,** 10.10–7; **Hurricane Conf., Miami, 1958,** 10.10–9; **WMO. Congresses,** 10.10–51; **Int. Conf. on Arctic Sea Ice** (Avsiuk), 10.10–54; **Applied Met. Conf.** (Malone), 10.10–114.

10.10–62 551.509.616:342.5

U. S. Congress. Senate. Committee on Interstate and Foreign Commerce, **Experimental research program in cloud modification. Hearings before a Subcommittee . . . 85th Congress, 1st session on S. 86, a Bill to provide for an experimental research program in cloud modification.** March 26 and May 13, **1957.** Wash., D. C., U. S. Govt. Print. Off., **1957.** 202 p. **DWB** (M09.67 U581ex)—This complete transcript of subcommittee hearings on a proposed research program in weather modification contains extensive testimony by authorities on various aspects of the field representing government agencies, research institutions and commercial or industrial organizations. The statements prepared or given under questioning cover results achieved in the past in scientific experiments and commercial operations, methods of evaluating cloud seeding effectiveness, research objectives for the future, legal and legislative problems, activities of the Advisory Committee on Weather Control, etc. Numerous reports and letters containing a variety of data are included, making this document one of the most extensive and diversified single sources of information on weather modification. *Subject Headings:* **1. Cloud modification research 2. Congressional hearings on cloud modification.**—*G.T.*

EDUCATION, HISTORY AND BIOGRAPHY

EDUCATION

10.10–63 551.5(02)

Lisachenko, F. P., **Uluchshim kachestvo uchebnikov dlia tekhnikumov.** [Let us improve the quality of textbooks for technical schools.] *Meteorologiia i Gidrologiia*, Leningrad, No. 4:56–58, April **1957. DWB, DLC**—Textbooks and supplementary material in the fields of meteorology, hydrology and oceanography in use in Soviet technical schools are criticized. Some are too large in scope, they are loaded with superfluous and secondary material, they duplicate the material of related disciplines, they are poorly written, etc. Among the textbooks criticized specifically, the following are listed: **Gidrografiia SSR** by A. A. Sokolov; **Stroitel'stvo gidrometricheskikh sooruzheniĭ** [Construction of hydrometric apparatus] by A. I. Chebotarev and A. P. Skue; **Klimatologiia** by S. I. Kostin and T. V. Pokrovskaia, etc. The special committee of the Central Hydrometeorological Service for receiving the manuscripts of textbooks, the authors of the textbooks, etc. are also criticized. It is pointed out that too few textbooks are written by teachers. **Met. i Gid.** is criticized because its reviews never take into account the methodological aspects of textbooks and other teaching aids. Measures for improving the quality of textbooks are outlined. *Subject Headings:* **1. Meteorology textbook improvement 2. U.S.S.R.**—*I.L.D.*

10.10–64 551.5:378

Florida. State Univ., Tallahassee, **Meteorology and climatology at Florida State Univ., Tallahassee, Florida.** July **1957.** 25 p.—The facilities and activities at Florida State University for graduate and undergraduate work in meteorology, climatology and oceanography, the teaching staff, curriculum and courses for 3 categories of students (undergraduates, advanced undergraduates and graduates), requirements for the B.S. degree, the M.S. degree and for 3 types of programs, a list of degrees conferred, assistantships, financial aid and other information about the school and staff at the time of publication are outlined. *Subject Headings:* **1. Meteorological education 2. Florida. State University. Dept. of Meteorology Tallahassee, Fla.**—*M.R.*

HISTORY

See: **Hist. of geomag.** (Balmer), 10.10–19; **Hist. of Smithsonian Inst.** (Abbot), 10.10–65.

BIOGRAPHY

See also: **Biog. of geomagneticians** (Balmer), 10.10–19.

10.10–65 551.5:92

Abbot, Charles Greeley (*Sec., Smithsonian Inst., 1928–1944*), **Adventures in the world of science.** Wash., D. C., Public Affairs Press, **1958.** 150 p. **DWB** (M:920 A126ad)—This fascinating book gives in a rambling yet informative style the inside story of the Smithsonian Institution during the past 60 years or more, written by one who is eminently qualified to speak of the famous people and events that enlivened official and scientific circles in Washington, D. C. during that era. During his decade as Assistant Director, Director, and Director Emeritus of this famous institution, Dr. Abbot came in constant contact with presidents and great scientists by the score. The personal recollections of these people are recounted in the 11 separate philosophical or semi-autobiographical chapters: 1) philosophy of life; 2) student days (how he became a scientist); 3) early years at Smithsonian (1895–1900), and reminiscences of S. P. Langley; 4) changes in Washington, D. C. since 1900; 5) impressions of presidents from Cleveland to Hoover; 6) associations with great men; 7) unusual experiences; 8) expeditions and work in distant lands; 9) scientific advances; 10) his Smithsonian Administration (1928–1944); research on solar power and long range weather prediction. *Subject Headings:* **1. Biography of C. G. Abbot 2. Abbot, C. G. 3. History of Smithsonian Institution.**—*M.R.*

10.10–66 551.5:92

†Gregor, A., **Vzpomínka na Univ. Prof. PhDr Stanislava Hanzlíka.** [In memoriam, Prof. Stanislav Hanzlík.] *Meteorologické Zprávy*, Prague, 10(1):1–2, **1957.** List of 40 of his scientific contributions, p. 2.—Also: Brandejs, Stanislav, **[Obituary of] Professor Dr. Stanislav Hanzlik, May 11, 1878–Oct. 8, 1956.** *Studia Geophysica et Geodaetica*, Prague, 1(1):7–9, 1957. In English. photo, list of 21 papers. Also: Kakas, J., **[Obituary of] Sztaniszlav Hanzlik 1878–1956.** *Időjárás*, Budapest, 61(1):60, Jan./Feb. **1957. DWB**—S. Hanzlík, one of the most honored meteorologists in Czechoslovakia and a scientist of international standing, died in Oct. 1956 at the age of 78. He had been in charge of the Meteorological Institute at Prague University for 40 years. With his works on the formation and properties of cyclones and anticyclones he paved the way to a new approach to synoptic meteorology. These works are still frequently referred to in international literature. He also made significant contributions to the study of solar weather relationships, and wrote a number of papers dealing with weather lore and singularities. *Subject Headings:* **1. Obituaries 2. S. Hanzlík.**—*G.T.*

BIBLIOGRAPHY

See also: **Upper air wind bibliogs.** (Hudson et al.), 10.10–26; **Agromet. bibliogs.** (Dionne et al.), 10.10–108.

10.10–67 551.5:016

†Debrecen, Hungary. Tudományegyetem, **Bibliographia Universitatis Debreceniensis, Pars 1, Facultas Scientiarum Naturalium, 1914–1955.** [Bibliography of the University of

Debrecen, Pt. 1, Faculty of Natural Science, 1914–1955.] Its *Acta Universitatis Debreceniensis* 3(3), **1956.** 303 p. **DLC** (Per. R.R.)—This is a bibliography of papers published by staff members of the University (while associated with the University or otherwise). It is arranged by departments, institutes and authors. The section for the Meteorological Institute (p. 285–300) contains listings of the following: 1) the Institute's publications ("Publication" numbered from 1 to 11 and yearbooks), 2) over 300 articles published by D. Berényi, Director of the Institute, and 3) publications of 6 other staff members. Foreign titles are included for papers of general scientific interest. The Meteorological Institute was founded in 1928 as part of the Geographical Institute. It became a separate institution (still under the geographical faculty) in 1934, and completely independent in 1949, with a chair since 1951. *Subject Heading:* **1. Meteorology bibliographies.**—*G.T.*

10.10–68 551.582(673):016

†Carraway, Darthula M., **Bibliography on the climate of Angola.** U. S. Weather Bureau, Dec. 17, **1956.** 25 p. 85 items, with abstracts. **DWB** (M016 U587ba)—A list of 85 annotated references to literature on the climate of Angola (through 1955), arranged alphabetically by author, and with a brief systematic (U.D.C.) and an alphabetical subject heading index. A large part of the publications is in Portuguese. The better sources are listed on the cover. *Subject Headings:* **1. Bibliography on climate of Angola 2. Climate of Angola 3. Angola. I. U. S. Weather Bureau. Office of Climatology.**—*M.R.*

10.10–69 551.5:629.13:016

†U. S. National Aeronautics and Space Administration, **Index of NACA Technical Publications, July 1957–Sept. 1958.** Issued Wash., D. C., June **1959.** 338 p. Final index of these series and the 7th supplement to the basic 1915–1949 **Index.** Includes research reports declassified during this period. Newly available research reports are currently announced in the **NASA Publications Announcements.** Chronological list of NACA reports under subject categories. Alphabetic index to subject categories. Author index.—Sec. 6 (**Meteorology**) on p. 281–3 lists 22 titles of NACA publications issued in 1957–58 on atmospheric structure, gusts, turbulence, lightning hazard and ice formation. Another score of titles of studies on acoustics is found under **Operating problems: Noise** on p. 289. *Subject Headings:* **1. U. S. NACA publications 2. Aeronautical meteorology.**—*M.R.*

10.10–70 551.521:016

†Shaw, J. H., **Survey of the literature on radiation in the atmosphere.** Ohio. State Univ. Research Foundation, Contract DA-36-039-Sc-78155, Technical Report, No. 1, Sept. **1958.** 174 p. Reproduction of typescript.—An excellent compilation of 387 annotated references to recent literature on every aspect of instrumentation for upper air temperature measurement and on radiation in the atmosphere (solar, sky, cloud and earth) affecting temperature measurement from the surface to 150,000 ft. At least half of the abstracts or references were obtained from the first 9 volumes of *MAB*. The subject breakdown of the abstracts is as follows: A) Books and review articles (24); B) Radiosondes and lag coefficients, properties of thermistors (59); C) Radiosonde comparisons (20); D) Solar radiation (12); E) Thermal radiation in atmosphere (line and band absorption and emission and effects of pressure and temperature therein, radiation charts) (58); F) Heat balance, cooling and theory of stratosphere (30); G) Experimental determination of radiation flux (30); H) Transmission in atmosphere (19); I) Scattering in atmosphere (25); J) Albedo of cloud, water, snow, etc. (39); K) Water vapor in atmosphere (12); L) CO_2 in atmosphere (7); M) O_3 in atmosphere (10); N) Physical properties of upper atmosphere (10); O) Clouds and dust in high atmosphere (13); P) Transmission through fog, haze and cloud (5); Q) Instruments for measuring temperature, wind and radiation in atmosphere (11); R) Numerical values of physical properties of atmosphere (3). An alphabetical index of authors and a list of journals from which abstracts have been taken are included. Credit is given wherever material has been quoted. *Subject Headings:* **1. Radiation bibliographies 2. Radiosonde bibliographies 3. Meteorological abstracts.**—*M.R.*

PRACTICAL AND APPLIED METEOROLOGY

OCEANOGRAPHY AND MARINE METEOROLOGY

See also: **Oceanog.** (Bruns), 10.10–13; **Tides** (Defant), 10.10–33; **IGY oceanog. program** (Kort), 10.10–47; **Long period oscillations, Pacific** (Berlage), 10.10–233.

10.10–71 551.501:551.526

Benditskiĭ, N. D., **Ob izmerenii temperatury poverkhnostnogo sloia vody v otkrytom more.** [Measurement of the temperature of the upper layer of water in an open sea.] *Meteorologiia i Gidrologiia*, Leningrad, No. 6:54–53, June **1958. DWB, DLC**—The various methods of measuring the temperature of the upper layer of sea water, in particular the use of the shipboard telemetering station in which the temperature receiver is located in the body of the ship (on the average 1.5 to 4.5 m below the water surface), are described. Into the tubes providing water for cooling the turbines, thermometers are inserted 2 or 3 m from the intake in the vicinity of cold and hot water pipes. An analysis of 1568 pairs of observations carried out in the Japan and Okhotsk Seas showed that the sailing region, season, waves and wind force during the period of observation do not influence substantially the intensity of mixing of surface waters by the moving vessel. In 95.9% of all observed differences between temperature observations made by the usual methods (standard) and by thermometers in the machinery there was only a difference of ±0.5°C. It is concluded that a moving ship facilitates the intense mixing of surface layer of waters up to a depth of 4–5 m and either ship telemetering station or thermometers in the machinery yield temperature measurements with an exactness up to 0.1°C. *Subject Headings:* **1. Water surface temperature measurement 2. Telemetering systems.**—*I.L.D.*

10.10–72 551.508.29:551.526.6

*Kontoboĭtseva, N. V., **Izmereniia pul'satsii temperatury v poverkhnostnom sloe moria.** [Measurement of temperature pulsation in the surface layer of the sea.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, 1:86–92, **1958.** 8 figs., 5 tables, 11 refs., 2 eqs. **DLC**—In order to investigate the microstructure of the temperature field in the sea a highly sensitive apparatus with a time constant not greater than 0.1 second is necessary. A device and method for measuring temperature pulsations with a semiconducting resistance thermometer are presented. A description of the apparatus is presented. The principal part of its electric circuit is a Wheatstone bridge and its sensitive element is a low resistance thermistor which is a semiconducting sphere 0.8 mm in diameter. Together with nickel leads it is inserted into a glass capsule. The leads are connected to the Wheatstone by a cable 20 m in length. The temperature fluctuations are recorded with an oscillograph-type POB-12. The speed of oscillograph paper was 1 and 4 cm/sec. The mode of operation of the thermometer, the errors that may arise in the semiconducting resistance thermometer as a result of changes in the velocity of water flowing about the thermometer, the relationship between temperature and the heat inertia of the thermistor, the calibration of the semiconducting resistance thermometer and the installation of the apparatus under field conditions and the making of observations are discussed with the aid of graphs and numerical data. The results of measurements of micropulsations of temperature are presented in tables. It is possible to divide the temperature changes in the surface layer of the sea into pulsations produced by waves with a mean period equal to the mean period of the waves (4–5 sec) with an amplitude of 0.060–0.080°, and irregular temperature changes of turbulent origin with a mean period of 0.8–1.0 sec and with a mean amplitude of 0.024–0.036°. The mean turbulence scale is 45 cm; according to Liebermann it is 60 cm. *Subject Headings:* **1. Sea surface temperature variations 2. Water temperature instruments.**—*I.L.D.*

10.10–73 551.461.2

Groves, Gordon W. (*Scripps Inst. of Oceanog.*), **Day to day variation of sea level.** *Meteorological Monographs*, Boston, 2(10):32–45, June **1957.** 6 figs., 2 tables, 11 refs. **DWB, DLC**—Tide gage data are submitted to a special averaging process that eliminates the diurnal and higher species tides. The process has been applied to simultaneous data from many

locations in order to obtain records of sea level. A typical value for the standard deviation of these records is 15 cm if attention is confined to a spectral window containing periods between two days and a month. With this restriction in mind the observed tide activity is largely associated with variable atmospheric pressure and wind. The principal effect of the varying atmospheric pressure is direct and instantaneous. The sea level records have been adjusted for this direct pressure effect. The standard deviation is reduced by about 50% on the average by this correction. Comparisons among water density and wind data are made. The wind is, of course, one of the major factors in producing sea level variations. Changes of water density produce small but observable effects. Other factors are discussed. *Subject Heading:* **1. Sea level variations.**—*Author's abstract.*

10.10–74 551.501.5:532.593:778.3

Levchenko, S. P., **Fotografirovanie voln s primeneniem setkinomogrammy.** [Photography of waves by means of a grid nomogram.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 2:269–271, Feb. **1958.** 3 figs., 4 refs., 4 eqs. **DLC**—The author describes a method for improving ordinary wave photography consisting essentially in precomputing a grid nomogram against the background of which the wave photograph is obtained. The fulfillment of the conditions involving the determination of the height of the objective of the camera above the level of calm water at sea, two methods of using a grid nomogram in wave photography, and the final calculation of the dimensions of the wave elements are described. The construction of the grid nomogram is described with the aid of diagrams showing the grid nomogram which consists of a rectangle divided into even squares. A schematic appearance of a wave when photographed against this grid and the equations for constructing the nomogram giving the height of the waves are presented. *Subject Headings:* **1. Grid nomograms 2. Wave photographs.**—*I.L.D.*

10.10–75 532.59:551.46

Prins, J. E., **Characteristics of waves generated by a local disturbance.** *American Geophysical Union, Transactions*, 39(5):865–874, Oct. **1958.** 9 figs., table, 6 refs., 15 eqs. **DWB, DLC**—Waves generated by an initial local elevation or depression of uniform height were investigated in a two-dimensional model. The height of the elevation or depression, the extent of the disturbed area, and the water depth were varied. The model data were compared with the theories of UNOKI and NAKANO (1953) and KRANZER and KELLER (1955). It was found that within certain limits of water depth, height, and extent of disturbed area, the wave characteristics, such as phase periods and interference pattern, could be described reasonably well. The magnitude of the wave heights was not predicted satisfactorily. *Subject Heading:* **1. Ocean wave generation.**—*Author's abstract.*

10.10–76 532.59:551.465(261)

Brooks, R. L. (*N. Y. Shipbuilding Corp., N. J.*); Jasper, N. H. (*David Taylor Model Basin, Md.*) and James, R. W. (*U. S. Navy Hydrographic Off., Wash., D. C.*), **Statistics on wave heights and periods for the North Atlantic Ocean.** *American Geophysical Union, Transactions*, 39(6):1064–1075, Dec. **1958.** 10 figs., 2 tables, 8 refs., eqs. (*See* 9D–145 for abstract of article of same title). **DWB, DLC**—This paper gives the frequency distributions of wave heights and wave periods obtained from weather ships stationed in the North Atlantic, together with an evaluation of the reliability of the visual wave height estimates comprising the basic data from which the distributions are derived. Visual estimates are compared with values determined from stereophotographs. An additional check is provided by wave meter measurements. It is shown that a log-normal distribution is applicable to the frequency distribution of wave heights experienced over a typical year and that this distribution is a useful guide to the determination of the incidence of a particular sea state at a given location. *Subject Headings:* **1. Ocean wave height data 2. Ocean wave period data 3. North Atlantic Ocean.**—*Authors' abstract.*

10.10–77 551.556.8:532.593:551.46

Brovikov, I. S. and Krylov, Iu. M., **Kriticheskiĭ analiz i otsenka formul L. F. Titova dlia rascheta elementov morskikh vetrovykh voln glubokogo moria.** [Critical analysis and evalua-

on of L. F. Titov's formulas for calculating the elements of marine wind waves on a deep a.] *Meteorologiia i Gidrologiia*, Leningrad, No. 2:37–41, **1958.** 2 figs., 1 table, 7 refs., eq. **DWB, DLC**—Titov's computation of the elements of oceanic wind waves were based upon the mpirical relationship between the fetch wind velocity and the duration of the wind action. he material which Titov employed to develop the empirical equation consisted of visual timates, of the wind and wave elements. The unsuitability of such data is stressed. The velopment of the formulas of Titov is summarized and their inadequacies and errors are ointed out with the aid of a table comparing heights of waves observed by Davidan and mputed by Titov. Also a comparison was made between the heights of waves in the 5% nfidence level with a fetch of 200 km for different wind velocities and computed by Titov's d Darbyshire's formulas. It is concluded that Titov's formulas are inadequate for actical purposes. *Subject Headings:* **1. Wind wave equations 2. Ocean wave theories. Titov, L. F.**—*I.L.D.*

10.10–78 551.465:532.52

Fel'zenbaum, A. I., **Obobshchenie teorii ustanovivshikhsia techenii melkogo moria na uchaì peremennogo koeffitsienta vertikal'nogo obmena.** [Generalization of the theory of eady currents in a shallow sea to the case where the coefficient of vertical exchange is a vari-ble.] *Akademiia Nauk SSSR, Doklady*, 113(1):86–89, **1957.** 6 refs., 22 eqs. **DLC**—The ex-hange coefficient is assumed as a variable in both the horizontal and vertical directions. The heory is given in general terms, including also the conditions near a shore. The currents in a osed shallow sea, depending upon wind and depth, are studied in some detail, assuming the ertical variation of the exchange coefficient as a power law with three different powers. *ubject Headings:* **1. Turbulent exchange in ocean currents 2. Ocean currents in shallow sea . Hydrodynamics.**—*A.A.*

10.10–79 551.509.5:532.59:551.46

Marks, Wilbur and Chase, Joseph (*Woods Hole Oceanog. Inst.*), **Observation of the growth nd decay of a wave spectrum.** *Meteorological Monographs*, Boston, 2(10):67–75, June **1957.** figs., table, 11 refs. **DWB, DLC**—In Oct., 1954, the R/V "Atlantis" of Woods Hole Ocean-graphic Institution was used for an observation program of wind and waves. This was part f a joint undertaking in wave research designed to obtain the two-dimensional energy spectrum f the sea surface by means of aerial stereophotography techniques. A series of wave records nd visual estimates of wave heights were made during two periods of high waves. The nformation obtained from the visual observations and from the wave pole records illustrates the vay in which the one-dimensional spectrum grows and decays in terms of the distributions of vave height and period. Hindcasts are made to verify the wave forecasting method of Pier-on, Neumann and James. Emphasis is made of the fact that prediction of wave statistics s largely subjective when wind parameters are evaluated from meteorological charts. The esults obtained from visual observations, wave records, and the prediction technique are ompared. By utilizing the energy spectrum technique, an adequate forecast can be made of he continuance of high seas long after the wind has lessened. Prediction of wave height is in easonably good agreement with observed heights. *Subject Headings:* **1. Ocean wave spectra nalysis 2. Ocean wave forecasting.**—*Authors' abstract.*

10.10–80 551.556.8:551.465(261/264)

Sarkisian, A. S., **K voprosu ob opredelenii statsionarnykh vetrovykh techeniĭ v baroklin-om sloe okeana.** [Determination of stationary wind currents in a baroclinic layer of the cean.] *Akademiia Nauk SSSR. Geofizicheskiĭ Institut, Trudy*, No. 37(164):50–61, **1956.** figs., 13 refs., 20 eqs. **DLC**—In calculating the distribution of stationary wind currents with epth in a baroclinic layer of the ocean, the latter is considered either (1) as a "free ocean," e. almost the entire basin except the areas adjacent to the coasts within a distance of 400–600 m or (2) the oceanic areas adjacent to the coasts. In the case of the former, the horizontal irrents are calculated on the basis of the atmospheric pressure; in the latter, following the rocedure of Munk and Carrier. Proceeding from simplified equations of motion of fluids in

spherical coordinates, two equations for determining zonal $\bar{\psi}$ and nonzonal ψ' parts of flow functions are derived. The final expression of the function of flow for a "free ocean" is presented. The equation for the flow near coasts was given by the author in *Akad. Nauk SSSR Izvestiia, Ser. Geofiz.* No. 6, **1954** (*see* 7.2–188, Feb. 1956, *MAB*). Five maps illustrating the theoretical currents obtained for the northern half of the Atlantic Ocean are presented. The reasons for the divergence of the results obtained by the author from those of EKMAN are discussed. *Subject Headings:* **1. Wind driven currents 2. Baroclinic layer of the sea 3. Ocean current measurements 4. Atlantic Ocean.**—*I.L.D.*

GLACIER ICE AND SEA ICE

See also: **IGY glaciology program** (Bader), 10.10–50; **Arctic sea ice conf.** (Avsiuk), 10.10–54; **Ice depth, Adélie Land** (Imbert), 10.10–57.

10.10–81 551.311.1(234.9)

Kovalev, P. V., **Lednik Bashil'.** [The Bashil' glacier.] *Vsesoiuznoe Geograficheskoi Obshchestvo, Leningrad, Izvestiia*, 90(1):59–62, Jan./Feb. **1958.** 3 figs., 8 refs. **DLC**—The Bashil' Glacier is situated in the upper reaches of the main source of the Chegem River—Bashil'-auz-su River. The greater part of its basin is on the slopes of the main Caucasus Mountain range between the peak of Sarykov-Cashi (4160 m) and the rocky Bodor. The Bashil' glacier is fed in part by snow and firn from the Granovskiĭ pass in the Adyr range; it is the largest glacier of the Bashil'-auz-su River region, having an area of 12.95 km² at present. During the topographic survey of the 1890's the lower part of the glacier consisted of three streams separated by rocky spurs. At present the principal stream is divided into two independent branches; the right, descending from the slopes of Basil'-lay peak and from the Alakhsedov passes; and the left terminating at a large precipice. As a result of glacial degradation in the Bashil' Glacial complex the number of independent glaciers has increased and the large Bashil' Glacier has broken down into several valley glaciers. Only the right branch can be designated as the Bashil' Glacier. Earlier observations on the position of the end of the Bashil' Glacier and descriptions of the boulders are presented. *Subject Headings:* **1. Glaciological observations 2. Glacier nourishment 3. Bashil' Glacier, Caucasus Mts.**—*I.L.D.*

10.10–82 551.579.3:551.311.1(826)

Heinsheimer, Georg J. (*Merlo, Argentina*), **Zur Hydrologie und Glaziologie des Lago Argentino und Ventisquero Moreno III.** [Hydrology and glaciology of Lake Argentino and Moreno Glacier, Pt. 3.] *Zeitschrift für Gletscherkunde und Glazialgeologie*, Innsbruck, 4(1/2) 61–72, **1958.** 12 photos, 9 refs. English and French summaries p. 61–62. **DWB, DLC**—The Moreno Glacier again closed up the Canal de los Témpanos in Aug. 1954. The inundation of the southern part of Lake Argentino which followed was ended by the outbreak of the dammed up waters during Oct. 9, and 10, 1956, after the occurrence of a partial outbreak some three weeks earlier. Hence the inundation lasted for 26 months, while all the known preceding floods ended after a shorter period; in the worst cases at the end of the summer after they began. The level of the closed up portion ascended to 23.36 m above the surface of the lake attained after the outbreak. The water volume that entered the closed up section, reached 76 m²/sec; but we have to take into consideration that there are different regimes of alimentation of the free and closed up portions, since the latter is principally nourished by fusion of the winter snow cover, while the former is supplied chiefly by glacier water. Moreover the period of that inundation was extraordinarily heavy in precipitation. We could observe also a small deviation to the S of the Moreno Glacier, due to the increase of its tributary glaciers of its northern side, whose ice masses have pushed aside the southern third of the glacier tongue to flowing into the dammed up part of the lake. After the outflow of the inundation a very big drift of the accumulated sediments by the predominant western winds made itself visible. (For Pts. 1 and 2, *see* 6.9–61, Sept. 1955 and 8.6–314, June 1957, *MAB*.) *Subject Headings:* **1. Glacial floods 2. Moreno glacier, Argentina 3. Lake Argentino, Argentina.**—*Author's abstract.*

10.10–83 551.311.13(573)

Ivan'kov, P. A., **Oledenenie Kamchatki.** [Glaciation of Kamchatka.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geogr.*, No. 2:42–53, **1958.** 5 refs., 5 illus., 2 tables. **DWB**—The total area of contemporary glaciation (1950) of Kamchatka embraces 866 km² (0.3% of the entire peninsula); of this area 484 km² are concentrated in several centers of glaciation in the Central Range of the Kamchatka Mts. Glaciers and snow caps in craters on the summits and slopes of volcanoes (outside the Central Range) occupy 262 km². The area of permanent snow on the slopes of the Eastern Range and of other interior mountains constitutes 34 km². In the mountain massif of the Kronotski Peninsula there is an isolated center of glaciation of 6 km² in area. With the aid of maps, the author describes in detail the physical characteristics of the glaciers. The contents of this paper include the following: an analysis of the snow line of Kamchatka as a function of prevailing winter climatic conditions; the glaciers of the Central Range; permanent snow on small volcanoes; and the glaciers of the Kronotski Peninsula. Tables giving data on the position of the orographic snow line on slopes of mountains of differing exposition and the height of the snow line on the slopes of the small volcanoes of the Klyuchevskiĭ group are presented. *Subject Headings:* **1. Glaciation 2. Glacial climates 3. Snow line 4. Kamchatka, Asiatic U.S.S.R.**—*I.L.D.*

10.10–84 551.311.182(282.251)

†Liser, I. Ia., **Vesennie zatory na r. Enisee u g. Krasnoiarska.** [Ice jams in spring on the Yenisei River near Krasnoyarsk.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, No. 68:37–62, **1957.** 6 figs., 6 tables, 19 refs. **DLC, DWB**—A comprehensive study on the conditions associated with the formation of ice jams on the Yenisei River in the Krasnoyarsk region where the best observational data are available, and an attempt to establish laws of ice jam formation so as to facilitate their forecasting. The literature on the formation of spring ice jams is reviewed briefly and it is pointed out that at present only for the Tomi River near Tomsk is there a method available for short range forecasting of ice jams. A fundamental characteristic of the ice regime of the Yenisei River is the variation of the extent of melting of the ice before its break-up as influenced by spring conditions. During 52 years of observation 17 cases of ice jam occurred. In the Krasnoyarsk region there are two centers of ice jams each of which has characteristic phenomena. The conditions of river freeze-up influence the formation of spring ice jams. If during the period of freeze-up an autumn ice movement was observed, a considerable sludge formation occurred so that a rather thick ice cover formed during the winter and hence less destruction of ice during spring. In the area with the extensive sludge the ice cover remained most durable at the moment of break-up so that ice jams are formed. Spring ice jams are the result of the simultaneous action of three principal factors; namely, conditions of freeze-up, severity of the winter and intensity of water during spring. For forecasting the degree of the ice jams at Krasnoyarsk the water level during the freeze-up period may serve as a quantitative characteristic of freeze-up conditions. Numerical and graphical data are presented on the variation of water level of the Yenisei River at Krasnoyarsk, on maximum ice thickness, maximum water levels during the formation of ice jams, influence of precipitation from the moment of ice freeze-up to March, sum of cold temperatures, etc. upon ice jams, dependence of maximum ice thickness upon winter cold, elements determining spring ice jams (winter severity, intensity of rise of water level), etc. *Subject Headings:* **1. Ice jams 2. River ice 3. Yenisei River.**—*I.L.D.*

ASTROPHYSICS

See also: **Vistas in astronomy** (Beer, *ed.*), 10.10–6; **Planetary atmospheres** (Strughold), 10.10–190; **Sunspot influences on atmos. tides** (Haurwitz et al.), 10.10–266; **Sunspot effects on zonal wind components** (Trenkle), 10.10–278.

10.10–85 523.75

Avignon, Y.; Boischot, A. and Simon, P. (*all, Observatory of Meudon*), **Caractères d'une émission solaire remarquable observée le 4 november 1957 sur 169 MHz.** [Characters of a remarkable solar emission, observed on Nov. 4, 1957 at 169 MHz.] *Annales d'Astrophysique*, Paris, 21(5):243–249, Sept./Oct. **1958.** 6 figs., 3 refs. English and Russian summaries p. 243.

DWB, DLC—On Nov. 4, a very exceptional solar emission was observed at 169 MHz. It unusual characteristics were very different than the ones characterizing noise storms and burst generally associated with chromospheric flares. It is suggested that some of the observe fluctuations originated in a seeing phenomenon close to the earth. *Subject Headings:* **1. Chro mospheric flares 2. Solar emission, Nov. 4, 1957.**—*Authors' abstract.*

10.10–86 551.510:523.4

Newkirk, Gordon, Jr. (*High Altitude Obs., U. of Colorado, Boulder*), **The airglow of Venus** *Planetary and Space Science*, N. Y., London, 1(1):32–36, Jan. **1959.** 3 figs., 7 refs. **DLC**— Low dispersion, high speed spectra of the unilluminated portion of Venus show emissio features at 4415 Å and 4435 Å which agree in position with those found by KOZYREV. KOZY REV'S other emission bands are not corroborated by these spectra. A previously unreporte emission band may be present at 4050 Å. The radiance of the emission bands centered a 4420 Å is about eighty times that of the 5577 Å line of the terrestrial airglow. It is unknow whether the emission from the dark side of Venus is of airglow or auroral character. *Subjec Headings:* **1. Airglow of Venus 2. Planetary atmospheres 3. Venus.**—*Author's abstract.*

10.10–87 523.7

Athay, R. G. (*High Altitude Obs., Colorado Univ.*), **The number of spicules in the middl chromosphere.** *Astrophysical Journal*, Chic., 129(1):164–171, Jan. **1959.** 3 figs., 3 tables 5 refs., 6 eqs. **DWB, DLC**—Statistics are given for the number of *Ha* spicules observed at th solar limb for heights of 3000 km and above. The observed numbers are analyzed to obtai the spatial distribution of spicules. It is found that at a height of 3000 km, there are about 9.3×10^4 spicules on the sun and that these spicules cover about 0.6% of the solar surface *Subject Headings:* **1. Chromospheric investigations 2. Spicules.**—*Author's abstract.*

RADIO ASTRONOMY

See also: **Cosmic radio wave trapping** (Ellis), 10.10–197.

10.10–88 523.72:551.521.1

Débarbat, Suzanne and Pecker, Jean-Claude (Obs. of Paris), **Le rayonnement radio électrique du soleil à différentes phases du cycle solaire.** [Radioelectric solar radiation a different phases of the solar cycle.] *Annales d'Astrophysique*, Paris, 21(5):250–259, Sept./Oct **1958.** 3 figs., table, 3 refs. English and Russian summaries p. 250. **DWB, DLC**—A com parative study of the observed asymmetries of the radioelectric eclipse light curves and o computed dissymmetries of the coronal activity eclipse light curves leads to provisional con clusions about the characteristics of radioelectric activity with respect to the optical activity of the solar corona. *Subject Headings:* **1. Solar radio radiation 2. Coronal activity.**—*Authors abstract.*

10.10–89 531.75:551.521.67:621.396.8

†Boischot, André, **Etude du rayonnement radioélectrique solaire sur 169 MHz, à l'aide d'un grand interféromètre à réseau.** [Study of solar radioelectric radiation on 169 Mc/s with the aid of a large multielement interferometer.] *Annales d'Astrophysique*, Paris, 21(6):273–344, Nov./Dec. **1958.** 41 figs., 2 tables, 36 refs. English and Russian summaries p. 273. **DWB, DLC**—The Nançay multi-element interferometer was designed for studies of solar radioemission at meter wave lengths. It gives a resolving power of 3'8 at 169 Mc/s and is able to locate the sources of enhanced radiation in the East-West direction with an accuracy better than one minute of arc. After a brief description of the equipment, we discuss the methods used for studying the sun and the radio sources, giving in each case the accuracy obtained. Then we describe different types of solar radio emission: the radiation from the quiet sun, including a new type of slowly varying component, the general properties of noise storms sources (position, diameter, height . . .) and a new flare-associated emission: the type IV outburst. *Subject Headings:* **1. Interferometers 2. Solar radio radiation 3. Chromospheric eruptions 4. Noise storms 5. Nançay, France.**—*Author's abstract.*

GEOMAGNETISM

See: **Hist. of geomag.** (Balmer), 10.10–19.

ASTRONAUTICS—SATELLITE OBSERVATORIES

See also: **IGY satellite program,** 10.10–1; **Soviet papers on satellites** (Lincoln Lab., MIT), 10.10–4; **Satellite obs. of ionosphere** (Al'pert), 10.10–200, 10.10–201.

10.10–90 551.507.362.2:551.510.535

Vselennaia raskryvaet svoi taĭny: issledovanie kosmicheskogo prostranstva s pomoshch'iu rket i sputnikov. [The universe reveals its secrets: investigations of cosmic space by means rockets and satellites.] *Pravda*, Moscow, 48(196, i.e. 14, 955):3–4, July 15, **1959.** photo, figs. "Report issued by A. N. Nesmeianov, pres. of the Akad. Nauk. March 1959." **DLC** lavic R.R.)—A substantial and official report of the "informative" type giving details of 'ogress in cosmic ray, radio propagation, ionosphere, micrometeorite, magnetic, interplanetary ises, belt of high radiation, upper atmosphere, composition, density, ionization (electron and ositive ion concentration), and biological research in space and, finally, basic concepts for osmic flights, as gained from the 3 Soviet "Sputniks" and later space probe flights. A number graphs showing quantitative results in the above fields are included. *Subject Headings:* **Soviet satellite results 2. Ionospheric research with satellites 3. Sputniks 4. U.S.S.R.** *-M.R.*

10.10–91 629.19

U. S. Congress. House. Select Committee on Astronautics and Space Exploration, **stronautics and space exploration. Hearings before the Select Committee . . . 85th ongress, 2d Session on H.R. 11881, April 15–18, 21–25, 28–30, May 1, 5, 7, 8, and 12, 1958.** ash., D. C., United State Govt. Print. Off., **1958.** 1542 p. figs., charts. **DWB** (629.1388 U581a) -A mammoth collection of statements from 50 or more men prominent in various fields, on all spects of space and related research with a view toward decisions on creation of the space gency (NASA) to replace and expand the work of the NACA. Lengthy testimony was given y Lloyd Berkner, Hugh L. Dryden, John P. Hagen, Joseph Kaplan, Admiral Rickover, . W. Reichelderfer and others interested in the geophysical phases. Much data are ncluded on economic, technical, organizational and scientific aspects. Biographical informaon on all of the participants is included along with their testimony. *Subject Headings:* **. Astronautics research and development 2. Space exploration. I. Reichelderfer, F. W.—** *I.R.*

10.10–92 551.507.362.2:551.506.22

Easton, R. L. and Votaw, M. J. (*both, U. S. Naval Res. Lab., Wash., D. C.*), **Vanguard I GY satellite (1958 Beta).** *Review of Scientific Instruments*, N. Y., 30(2):70–75, Feb. **1959.** 1 figs., 2 tables, 3 refs. **DWB, DLC**—The instrumentation used, the measurements obtained, nd the uses of the Vanguard I satellite are described. This satellite contains two transmitters, ne powered by batteries for about three weeks and one powered by solar cells (still operating). rom the transmitted frequencies temperature information and rotation rates are obtained. he transmitted signals are also used to determine the satellite orbit. An approximate free rbital lifetime of 200 years is predicted. *Subject Headings:* **1. IGY satellite program 2. Proj- ct Vanguard.**—*Authors' abstract.*

10.10–93 629.19:52.001.5 551.507.362.2:551.510.4

Nicolet, M., **Les observations scientifiques à l'aide des satellites artificiels.** [Scientific bservations by means of artificial satellites.] *Belgium. Institut Royal Météorologique, ontributions*, No. 46, **1959.** 7 p. **DLC.** Reprinted from *Société Royale Belge des Ingénieurs et s Industriels*, [*Publication?*], No. 12:527–533, **1958.**—The author describes accurately the ata gathered at the present time by observation of the three artificial satellites launched, and dicates what results may be expected. The assumptions advanced regarding composition the atmosphere seem to be confirmed through the observations of satellites. These are the ly conclusions that can be drawn up to now. The other data which may be expected to be

obtained are indicated as well as the methods used for this purpose. There are two problem for which the use of satellites is very useful: 1) the analysis of the energy spectrum of cosm radiation with regard to latitude in the course of one cycle of solar activity through an orb crossing the poles; 2) the distribution of the lines of force of the earth's magnetic field, at grea distance, could be investigated through examining the change in intensity. Advantage artificial satellites over rockets is enormous. In spite of the large number of rockets fire these could only supply observations for a total of 24 hrs, and in this total there are only 1 minutes of observation at an altitude higher than 200 km. The great difficulty with satellite is their return to earth. *Subject Headings:* **1. Satellite observatories 2. Atmospheric com position 3. Cosmic radiation 4. Earth's magnetic field.**—*A. V.*

10.10–94 551.594.52:551.506.22(72

Adem, Julián, **Auroras observed in Mexico and Cuba during the International Geo physical Year.** *International Geophysical Year, 1957/1958. Comité Nacional Mexican Results of the IGY in Mexico, Report*, No. 1:1–9, Dec. **1958.** 2 figs., table. **DWB** (551.0 I613re)—An aurora was observed on Sept. 13, 1957 in northern Mexico (Guaymas at 28°N and Hermosillo at 29°N). A sketch is shown. The top of the reddish veil was at an angle 35° and rays reached 45° above the horizon. Another was observed on Sept. 23, 1957 a many places in Cuba (orange-red to dark red) to a height of 25° above the horizon in the nortl A third was seen on Feb. 11, 1958 at several places in Mexico and Cuba (a list of coordinates included). Red and orange colors were observed in the arc which reached 45° at uppe boundary in Mexico and 30° in Cuba. The same aurora was observed all over the U. S throughout the night. In lower latitudes it started later than at high latitudes. The lowe latitude was 19°07′N at Atzomoni, Mexico. *Subject Headings:* **1. Low latitude aurora 2. Auroras, Mexico 3. IGY auroral program 4. Mexico 5. Cuba.**—*M. R.*

10.10–95 551.507.362.2:551.506.2

Adams, R. M.; Briggs, R. E. and Upton, E. K. L., **Positions of satellite 1957 Beta on during the first 100 revolutions.** *International Geophysical Year, 1957/1958. IGY Worl Data Center A, IGY Satellite Report Series*, No. 6:39–60, Aug. 15, **1958. DWB** (629.138 R425re). Reprinted from *Smithsonian Institution. Astrophysical Observatory* (*IGY Proje 30.9 and 30.10*) *Special Report*, No. 16 (on the Optical Satellite Tracking Program), July 2 **1958.** 2 p.+numerous tables. **DWB**—Satellite 1957 Beta one positions are presented i tabular form. Reference is made to a fuller report in the *Smithsonian Astrophysical Observator Special Report*, No. 13 which gives complete orbital results for the entire lifetime of this satellite These results achieve an accuracy of better than one degree in geographic latitude and longitud and 2 km in height above the earth's surface. *Subject Headings:* **1. IGY satellite progra 2. Satellite tracking.**—*N. N.*

10.10–96 551.507.362.2:551.510.

Schmidt, K. H., **Der Dichteverlauf in der hohen Erdatmosphäre.** [Distribution of densit in the high terrestrial atmosphere.] *Die Naturwissenschaften*, Berlin, 46(4):138, Feb. **1959** fig., 3 refs. **DLC**—Observation of artificial satellites made it possible to determine the densit in the high terrestrial atmosphere. The author comments on the density established b T. E. STERNE and G. F. SCHILLING after observation of 1957α, 1957α_2 and 1957β. The es tablished densities are shown in a figure and commented on. *Subject Headings:* **1. Upp atmosphere density 2. Satellite observatories.**—*A. V.*

10.10–97 551.507.362.

Wexler, Harry, **Satellites and meteorology: a report to the World Meteorological Or ganization.** Wash., D. C., March 31, **1959.** 17 p. 13 refs. Mimeo. **DWB** (M07.362. U587sa)—Weather satellites can be used to locate cloud areas or storms in the vast area without sounding stations, to determine the radiation balance of the earth and conditions in th top half of the atmosphere. Orbits of large eccentricity, useful in some studies, should b avoided for weather investigations. The polar and the equatorial orbits are discussed wit respect to their relative merits and the optimum heights and equipment. Communicatio

[t]tellites might play a role in world-wide weather map preparation. Coordination on an inter-[n]ational level, between the various ICSU, (COSPAR) and WMO committees and those of [I]AV, IUGG, VRSI, etc. is discussed and recommendations of COSPAR to WMO listed. *[S]ubject Headings:* **1. Satellite observatories 2. Meteorological satellites.**—*M.R.*

AERONAUTICAL METEOROLOGY

See also: **Aeronautical met.** (Ångström), 10.10–10; **Aeronautical met.** (Förchtgott), 10.10–16; **Upper air climat., U. S.** (Ratner), 10.10–23; **Gliding** (Gotch), 10.10–34; **Aeronautical met. bibliog.**, 10.10–69; **Radiation fog, Rhein/Main airport** (Lamp), 10.10–180; **Gliding and wave movement** (Tardos), 10.10–229.

10.10–98 551.515.4:629.13

Kogan-Beletskiĭ, G. I., **Polety na bol'shoĭ vysote pri grozovoĭ deiatel'nosti.** [High-[a]ltitude flights under conditions of thunderstorm activity.] *Sovetskaia Aviatsiia* [Soviet [A]viation], (Moscow?), No. 175:2–3, July 26, **1957.** Trans. into English issued as U. S. Air [F]orce, Air Intelligence Information Report. Available for reference **DWB** (M15.4 K78hi). [4] p. Reproduction of typescript.—Gives a description of the peculiarities of flights in thunder-[s]torm, the development of thunderstorms over the Soviet Union as a result of strong upward [m]ovements of the air, the dangers involved when the aircraft is unexpectedly exposed to [v]iolent turbulence, electric discharges and icing conditions. The author suggests that flying [p]ersonnel should have a thorough knowledge of these peculiarities and that flight supervisors [a]nd crews should have a timely warning on the intensity of the thunderstorm in order to avert [a]ny danger. *Subject Headings:* **1. Thunderstorm flights 2. Thunderstorm development [3]. Thunderstorm avoidance 4. Aeronautical meteorology 5. Translations 6. U.S.S.R.**—*[V.N.*

10.10–99 551.509.34:551.589.5:767.71

†Atkins, J. E., **Fitness figure statistics as an aid in local forecasting.** *Meteorological [M]agazine*, London, 87(1035):268–272, Sept. **1958.** 3 figs., 3 tables, ref. **DWB, DLC**—A [d]escription of the local topography of Stradishall is given, the effect of the East Anglian ridge [u]pon local weather is discussed, and an example of poor flying conditions in southeasterlies is [d]escribed. The up-slope on the southeast side of the ridge appears to have been a significant [f]actor affecting the persistence of fog and stratus. Fitness figures, which give a measure of the [f]itness of an airfield for the loading of aircraft and which take into account height of low cloud [v]isibility, precipitation and wind, etc. are given for Stradishall and also for Waterbeach. The [d]ifference between these fitness figures indicates that the poor weather in southeasterly winds [a]t Stradishall is not due solely or mainly to low cloud and drizzle before eastward moving warm [f]ronts and occlusions. Synoptic charts and data on fitness figures are presented. *Subject [H]eadings:* **1. Airport landing forecasts 2. Fitness figures in local forecasts 3. Stradishall, [E]ng.**—*I.L.D.*

10.100 551.5:629.13(211)

Comet, Paul, **La navigation aérienne polaire.** [Polar air navigation.] *Interavia*, [G]eneva, 13(5):404–406, May, **1958.** 5 figs. **DWB**—Statement of the difficulties met by the [p]olar air navigation and description of the methods to cope with them: nearness of the geo-[g]raphic pole, nearness of the magnetic pole, long duration of solar twilight. The atmospheric [c]onditions encountered aloft are, on the average, more favorable over the Arctic regions than [o]ver the temperate and tropical zones. *Subject Heading:* **1. Arctic flying.**—*A.V.*

10.10–101 629.13:551.510.53:551.551.5:551.557.5(02)

§Pchelko, Ivan Grigor'evich, **Meteorologicheskie usloviia poletov na bol'shikh vysotakh.** [Meteorological conditions for flight at great heights.] Leningrad, Gidrometeoizdat, **1957.** [5]3 p. 23 figs., 9 tables, 8 refs. **DLC** (TL556.P35)—A bulletin presenting the latest general [i]nformation on high level flying conditions for jet planes, including information on the tropo-[p]ause (tropopause waves, effect of cyclones and anticyclone development on tropopause and

vice versa, temp. at the tropopause, winds, jet stream); cloudiness at tropopause; flying condi tions in warm and cold front zones; turbulence, seasonal frequency of turbulence at 10–11 km on Moscow-Novosibirsk route; relation of synoptic type to high level turbulence; aircraf icing and relation to speed of aircraft and air temp.; and examples of flight plans and forecasts Many synoptic examples are illustrated by 200 mb, tropopause or cross section charts. *Subject Headings:* **1. High altitude flying conditions 2. Tropopause analysis 3. Jet stream ove U.S.S.R. 4. High level turbulence 5. Aeronautical meteorology manuals.**—*M.R.*

10.10–102 551.5:629.1

Roche, Robert D. (*Lockheed Aircraft Corporation*), **The aircraft industry and meteorology** *Weatherwise*, Boston, 10(5):154–157 and 176, Oct. **1957.** 3 photos. **DWB.** Also in: *Nationa Conference on Applied Meteorology, Hartford, Conn., Oct. 1957.* Section A:27–32. **DW** (M A512 pro)—A meteorologist, working as an Operations Research specialist, can participat in almost every phase of aircraft production (as is the case in the Lockheed aircraft operations —long range planning, engineering and development, airframe manufacture, sales engineering special facilities (such as nuclear laboratories), testing—in fact, any place that applied researc is involved. Pure research is usually not considered. *Subject Headings:* **1. Industrial me teorology 2. Applied meteorology 3. Aeronautical meteorology 4. Operations Research** —*M.R.*

10.10–103 551.551.25:629.1

†Tobak, Murray (*Ames Aeronautical Laboratory, Moffett Field, Calif.*), **On the minimizatio of airplane responses to random gusts.** *U. S. National Advisory Committee for Aeronautic Technical Note*, 3290, Oct. **1957.** 71 p. 13 figs., 4 sketches, 39 refs., 57 eqs. **DWB**—Exac theoretical responses in normal acceleration and pitching velocity to step and harmonic gust are calculated for the rectangular wind flying at Mach number 1.2. These are used to asse the validity of approximate solutions. Alleviation of the airplane's response to random gust is studied by means of optimum filter theory. The transfer function is derived of a contro system that minimizes a linear combination of the airplane's mean-square normal acceleratio and mean-square pitching velocity. Results of computations indicate the system may caus significant reductions of both motions. *Subject Headings:* **1. Aircraft response to atmospheri turbulence 2. Gust loads.**—*NACA abstract.*

10.10–104 629.12:551.510.5

Veranneman, N. L., **Meteorology and longhaul civil turbine-powered aircraft operation** *World Meteorological Organization, WMO Bulletin*, 7(3):104–107, July **1958.** **DWB**—A genera review of problems confronting meteorological services attempting to provide informatio and forecasts to long distance turbine aircraft. Temperature is a critical factor in fuel con sumption, and winds, hail, turbulence and icing are important. Hence, the WMO has issue or will issue, monographs (technical notes) covering present knowledge of high level wind forecasting the jet stream and high level winds and hail, turbulence and icing. Guidance wi be given to new services through technical assistance program. *Subject Headings:* **1. Hig altitude flying conditions 2. Turbine aircraft operations.**—*M.R.*

10.10–105 551.58:629.135(798

Wood, C. P. and Gleason, J. J. (*both, Climatic Center, Hq. Air Weather Service*), **Weathe and flying in Alaska.** *Weatherwise*, Boston, 11(5):161–163, Oct. **1958.** photo, 3 refs. **DWB** Flying conditions in the interior of Alaska and over the Ptarmigan route from Fairbanks to th N. Pole and back are not as bad as one might guess, especially in comparison with those ov the North Atlantic (81% in clear compared with 69% over N. Atlantic), nor are termina conditions as bad as Los Angeles, Chicago and New York. Regional flying weather over th interior Alaskan Gulf, Arctic coast, Bering Sea and Aleutians is briefly discussed. Peculia hazards such as ice fog, ice and snow on runways and aircraft, low temperatures, supercoole fog and Arctic haze are also highlighted. For instance, a field may be fogged in by the exhaus of the plane which is being warmed up for takeoff. *Subject Headings:* **1. Arctic flying 2. Avia tion climatology 3. Alaska.**—*M.R.*

AGRICULTURAL METEOROLOGY

See also: **Reports of session of WMO Agromet. Commission,** 10.10–5; **Radioactivity in crops** (Barbier et al.), 10.10–214; **Potato field microclimate** (Muminov), 10.10–269.

10.10–106 551.577.38(478)

Blagoveshchenskiĭ, I. V., **Zasukha v predelakh Tatrespubliki i mery bor'by s neĭ.** [Drought in the Tatar Republic and countermeasures.] Kazan', **1927.** 32 p. tables. At head of title: Narodnyĭ Komissariat Tat. S.S.R. Kazanskaia oblastniia Sel'sko-Khoziaistvennaia Opytnaia Stantsiia. **DLC** (QC929.D8B55)—A small pamphlet giving rudimentary data and information on drought and dry winds in the Tatar Republic. Cultivating and crop rotation, snow retention and other measures for conserving soil moisture are outlined. The drought of 1921 which caused widespread famine is highlighted in text and shown in data tables with respect to other years (1917–24) in the Tatar Republic. *Subject Headings:* **1. Drought control 2. Agricultural meteorology 3. Tatar, A.S.S.R.**—*M.R.*

10.10–107 551.586:635(47)

Ventskevich, G. Z.; Kirilicheva, K. V. and Rudnev, B. M., **Ispol'zovanie znaniĭ o klimate i pogode v plodovodstve.** [Utilization of the knowledge on climate and weather in fruit culture.] Leningrad, Gidrometizdat, **1957.** 73 p. 24 figs., 12 tables. **DLC** (S600.V4)—The usefulness of meteorological and climatic data for selecting varieties or species of plants to suit particular regions of the U.S.S.R. is discussed, followed by a chapter on the effects of microclimate or topoclimate on suitability of sites for planting. Then the various types of unfavorable weather factors during spring, summer and winter and methods of combating frost, soil freezing, moisture deficiency, etc. are reviewed. Finally, a chapter on the influence of weather on the time of harvest and other horticultural work, and possibility of more efficient use of labor forces by careful consideration of weather factors to be expected at various stages in the development of the fruit is included. Numerical and graphical illustrations, as well as schematic diagrams, are used throughout. *Subject Headings:* **1. Climatic effects on horticulture 2. Agricultural climatology 3. Horticulture 4. U.S.S.R.**—*M.R.*

10.10–108 551.5:63:016

†Dionne, J. L.; Robertson, George W. and Holmes, R. M., **Agricultural meteorology: a brief literature review and bibliography.** Experimental Farms Service, Canada Dept. of Agriculture, **1956.** 59 p. 3 tables, 578 refs.—Nearly 600 unannotated references to periodical literature in the field of agricultural meteorology are arranged alphabetically by author under 16 headings: plants and climate, weather and crop yield, microclimate, phenology, light, temperature, temperature and light interaction, cold, evaporation, rainfall, soil moisture, dew, drought, weather and disease, growth and miscellaneous. A fairly complete review of various phases of plant response to physical factors and to weather, and experimental methods and research are included in the 13 pages of text. *Subject Heading:* **1. Agricometeorological bibliographies.**—*M.R.*

10.10–109 551.579.5:63(478)

Rudnev, G. V., **O rezhime vlazhnosti pochvy na poliakh, obrabotannykh po sisteme T. S. Mal'tseva (predvaritel'noe soobshchenie po rezul'tatam nabliudeniĭ v 1955g).** [The soil moisture regime in fields cultivated according to the system of T. S. Mal'tsev (preliminary information based on results of observations in 1955).] *Meteorologiia i Gidrologiia,* No. 10:37–39, Oct. **1956.** 3 tables. **DWB, DLC**—Data on the soil moisture content of soils cultivated by the T. S. Mal'tsev method were collected in the Penza Oblast, the Tatar A.S.S.R., Ulyanovsk Oblast, etc. in 1955. During the growing season of 1955 the weather conditions were not favorable to grain crops since in most areas the rainfall was less than normal during the first half of the year. Under conditions of unfavorable rainfall and high temperature, the drying of fields cultivated according to the Mal'tsev method occur more slowly than of fields cultivated by other methods. *Subject Headings:* **1. Soil moisture studies 2. Agricultural meteorology 3. Penza Oblast, U.S.S.R.**—*I.L.D.*

10.10–110 551.579.5 :582.632 (4

*Razumova, L. A., **Agrometeorologicheskie usloviia gibeli dubkov.** [Limiting agr meteorological conditions for the survival of oak seedlings.] *Moscow. Tsentral' nyĭ Instit Prognozov, Trudy*, No. 53 :58–74, **1957.** 6 tables, 7 refs. **DLC**—This study on meteorologic conditions leading to the death of oak seedlings is based upon several years of investigation experimental forest stations located in the Chkalov and Kuibyshev Oblasts. Oak seedlin fail to survive primarily because of insufficient moisture in the upper soil layers during th period of turgidity and germination. Complete destruction of developed seedlings can resu either from the dying off of the root system or from the dying of all shoots or buds. S drought and low temperature during the winter are fundamental causes of the death of oa seedlings. Frosts, sukhovei winds, and high temperature during vegetation usually injure th parts of the plant above the ground but do not destroy the entire plant. The injurious effe of soil drought during the early period of their growth and development is infrequent. Th response of oak seedlings to frost is very marked. If killing frosts destroy not only the par above ground but also the root systems, then the seedling destruction is evident in the first da of vegetation; the injured seedlings fail to form leaves. Frosts of the same intensity affe differently seedlings of varying growth and degree of preparation for wintering. Numeric data on atmospheric conditions associated with the survival of oak seedlings, the conditio of the seedlings at various stages of growth in row and "nest" seeding, etc. are presented tables and throughout the text. *Subject Headings:* **1. Soil moisture deficiency 2. Soil droug effects on oak seedlings 3. Killing frosts 4. Oak seedlings 5. European U.S.S.R.**—*I.L.*

FOREST METEOROLOGY AND FIRE WEATHER

See also: **Jet stream-forest fire relationships** (Schaefer), **10.10–232.**

10.10–111 551.577 :634.94 (43

*†Baumgartner, A., **Die Regenmengen als Standortfaktor am grossen Falkenstein (Baye Wald).** [The amount of rain as a local factor on the Grosser Falkenstein, Bavarian Forest *Forstwissenschaftliches Centralblatt*, Berlin, 77 (7/8) :231–237, **1958.** 4 figs., 2 tables, 10 ref Also his: **Nebel und Nebelniederschlag als Standortsfaktoren am Grossen Falkenste (Bayerischer Wald).** [Fog and fog precipitation as local factors on the Grosser Falkenstei Bavarian Forest.] *Ibid.*, 77 (9/10) :257–272, **1958.** 9 figs., 10 tables, 22 refs. **DLC**—Son general characteristics of rain and fogs in forests are discussed with stress on the influence c the water economy. The studies were conducted at 14 stations in the mountain region of th Grosser Falkenstein (1312 m.a.s.) in the Bavarian Forest during May 1954–Sept. 1957. Th graphical and tabular data comprise distribution in time and in percent. Amount in perce of precipitation (dew, fog, rain) is given. In the vegetative period the water amount is show to increase by 2,000 mm due to rain and fogs. *Subject Headings:* **1. Forest hydrology 2. Pr cipitation effect on forest hydrology 3. Grosser Falkenstein, Bavarian Forest.**—*W.N.*

10.10–112 551.509.34 :632.18

Filimonov, V. P. and Nikol'skiĭ, K. N., **O shkale gorimosti i prognozakh pozharoopasnos v lesu.** [Combustibility scale and prediction of forest fire danger.] *Meteorologiia i Gidr logiia*, Leningrad, No. 4 :38–39, April **1958.** table, ref. **DWB, DLC**—The authors descri a method of establishing a combustibility scale for predicting forest fires, developed by B. I Landre (*Lesnoe Khoziaĭstvo*, No. 11, **1953**), and give the results of its comparison with th combustibility scale of V. G. Nestorov. Landre's index of combustibility is the sum of a temperature and saturation deficit and the scale of combustibility is different for spring a summer. A particular coefficient is obtained and is multiplied by the amount of precipitatio (mm) as a function of number of days without rain. A "negative combustibility" scale whi characterizes the degree of the forest litter is introduced. A scale of extinction of negati combustibility is developed. This scale indicates the day on which a fire may occur after th origin of negative combustibility. Corrections for wind velocity are introduced. It wa found that spring has more forest fires than summer in the Tuva Autonomous Republic. comparison of combustibility scales of Landre and Nestorov for 1952 and 1954 in the Tuv Autonomous Republic shows that the former is more precise in predicting the frequency

rest fires. Illustrative examples of the use of LANDRE's tables of decreasing "negative mbustibility" are presented. *Subject Headings:* **1. Forest fire forecasting 2. Inflammability dex.**—*I.L.D.*

10.10–113 551.577.38:632.187

†Nelson, Ralph M., **Drought estimation in southern forest fire control.** *U. S. Forest rvice. Southeastern Forest Experiment Station, Station Paper*, No. 99, Feb. **1959.** 22 p.) figs., table, 28 refs. **DWB** (634.9 U583s)—Several fire danger rating meters or indexes Buildup Index, etc.), used in the East and South, give good indications of dryness in the per layers of the forest floor fuel, but do not pretend to be reliable for measuring the deep yer dryness during extended drought. A possible measure of drought intensity to use as a pplement to present methods of estimating fire danger is described and illustrated. It is ased on THORNTHWAITE's ideas on moisture balance from precipitation, evaporation and anspiration. Evapotranspiration, its effect on soil moisture content, methods of measuring il moisture, effect of and type of vegetation, of root distribution, range of available water ilt/wiltpoint and field capacity), soil moisture accretion, calculation of evapotranspiration, amples of soil moisture depletion curves (Georgia, Florida, Arkansas) are discussed. Application techniques and sample forms and curves are included. *Subject Headings:* **1. Fire danger ting 2. Drought estimation 3. Southeastern United States.**—*M.R.*

INDUSTRIAL METEOROLOGY

See also: **Aircraft industry and the meteorologist** (Roche), 10.10–102.

10.10–114 551.5:6:061.3

Malone, T. F. (*Travelers Ins. Co. Hartford, Conn.*), **Whither applied meteorology in the nited States?** *National Conference on Applied Meteorology, Hartford, Conn., Oct. 1957, roceedings*, issued **1957.** Section D:20–27. **DWB** (M A512pro)—Lecture deals with the ndustrial aspects of applied meteorology, of which some examples are cited. The private ractice of meteorology is reviewed and future trends outlined including education, experience, thical proficiency and authorization as suggested by some over-all organization to be established. Possibility of cooperation and/or sponsorship by governmental, industrial, scientific nd professional bodies is considered. Another conference next year and a follow-up seminar nder the auspices of the American Managements Association are suggested. *Subject Headings:* **. Applied meteorology conferences 2. Industrial meteorology.**—*W.N.*

10.10–115 621.47:551.521.1

Poiarkov, S. G., **Tekhniko-ekonomicheskie pokazateli solnechnykh ustanovok.** [Technico-economical indexes of solar installations.] *Akademiia Nauk SSSR. Energeticheskiĭ nstitut, Ispol'zovanie solnechnoĭ energii, Sbornik* 1, issued Moscow, **1957.** p. 214–231. 11 ables, eqs. **DWB** (621.47 B347is)—The author discusses the indices characterizing construction expenditures, namely: initial capital investment, expenses of the fundamental onstruction materials (metal, cement, wood, mirror), area for construction, weight of the olar installation, expenditure of work in construction, matériel investment and equipment, nd the indices characterizing the operation of the installation namely: efficiency productivity f the installation, amortization expenditures, expenditures for current and capital repairs, and ost of production. Actual computations of the various characteristics are carried out with he aid of formulas and the results are given in tables containing energy indices for solar water eaters of the tube type, energy indices of installations with concentrators for obtaining boiling ater and steam, comparative data on capital expenditures involved in constructing a solar nstallation, comparative data on the matériel expenditures and weights in the construction of olar installation for 1 m^2 mirror. Details of annual expenditures for solar installations, etails of annual expenditures for solar stations and work expenditure in man hours per 1 m^2 rface of a receiver are analyzed in terms of wage rates, technical economic indices of solar nstallation used for heating water up to 50° and 70°C, for obtaining steam ($l = 300$°C, $P = 13.5$ tmospheres, $t = 50$°C), and comparative technical economic data of solar and coal heat in istilling water at a productivity of $Q = 2.10^3$ million kilocal/year. *Subject Heading:* **1. Solar nstallation indexes.**—*I.L.D.*

MEDICAL METEOROLOGY

See also: **Frontal effects on human health** (Säuberer), 10.10–238; **Frontal effects on nervous reaction** (Kérdö), 10.10–301.

10.10–116 551.586:616.89 551.586:616.2

*Tromp, S. W. (*Netherlands*), **Recent studies in the possible biometeorological periodici of asthma attacks and of mental diseases in the Netherlands.** *International Journal Bioclimatology and Biometeorology*, Leiden, Vol. 1 (Pt. 4, Human Bioclimatology), **1957.** 18 5 tables, 4 figs., 8 refs. **DWB**—The author describes meteorological and clinical methods at th Biometeorological Research Center of the University Medical Center at Leiden in the stud of the relationship between weather and climate and the incidence of such diseases as influenz thrombosis, rheumatic diseases, asthma and mental diseases. Preliminary results of th studies on bronchial asthma and on mental diseases (schizophrenia, oligophrenia and epilepsy are presented. Of the various meteorological elements only the passage of cold fronts (an various meteorological factors related to them) is closely related to increases in asthma attack Warm fronts appear to be associated with a decrease in asthma attacks. The marked increa in asthma attacks occurs long before an actual drop in temperature can be observed in th lower atmosphere. The possible relationship of asthma attacks to meteorological phenomen involving sympathicus and parasympathicus tones is discussed. In the case of mental disease no correlation was found between days with increasing electromagnetic impulses and restles ness, but days with few electromagnetic impulses showed a higher incidence of restlessnes An increase of ill-temperedness seems to occur between January and May. The daily pe centage of patients with epileptic attacks was highest in February and March and lowest May–June and steeply rising in September. *Subject Headings:* **1. Medical meteorolog 2. Weather effects on asthma 3. Weather effects on mental diseases 4. Asthma 5. Ment diseases 6. Netherlands.**—*I.L.D.*

10.10–117 551.586:616.

Trauner, L. (*Yugoslavia*), **Die Bioklimatologie der rheumatischen Erkrankungen Jugoslawien.** [Bioclimatology of rheumatic diseases in Yugoslavia.] *International Journ of Bioclimatology and Biometeorology*, Leiden, Vol. 1 (Pt. 4, Human Bioclimatology), 195 2 p. 2 figs. table. **DWB**—The various climatic types characteristic of Yugoslavia a described with special reference to their role in the genesis and therapy of rheumatic disease Atmospheric humidity, insufficient solar radiation and meteorotropic cyclonic disturbanc are associated with prodromal and synchronous weather sensitivity. Therapeutic climat are the coastal climate indicated for children as a prophylaxis against rheumatism. A tab with climatic data for the principal weather stations in Yugoslavia and maps showing th climates of Yugoslavia classified according to the Köppen system and the distribution o rheumatic diseases in Yugoslavia in per cent of all other traumatic diseases are presente *Subject Headings:* **1. Climatic effects on rheumatism 2. Rheumatism 3. Yugoslavia.**—*I.L.*

10.10–118 551.586:6

†Daubert, K. (*Tübingen*), **Spezifische Reizkomponenten des Wetters und ihre Beziehun zum gesunden und kranken Organismus.** [Specific weather stimuli and their effects on th healthy and diseased organism.] *Annalen der Meteorologie, Medizin-Meteorologische Heft* No. 13:63–76, **1958.** 10 figs., 42 refs. **DWB**—In this discussion of the influence of weathe elements upon the organism, the author summarizes various studies on the response of th organism to thermal stimuli, the response of the organism to combinations of weather eleme constituting the weather phases of Ungeheuer or the effective phases of Flach, etc; th specific weather elements of the various weather phases; the dynamic atmospheric processes a indications of various weather element combinations (i.e., downglide at the edge of a high weak subsidence, etc.) and their modification of physiological reactions by the orographi influences upon atmospheric processes; the deviation from the normal manifested by bloo pressure as influenced by weather phases; the relationship between complex atmospheric effec and complex physiological responses such as trough-divergence processes, etc. and hypertoni hypotonic or atonic states, etc. Specific relationships between atmospheric complexes an

ubjective sensations of discomfort, headache and asthma, between frontal passages and daily ortality, between air masses and daily mortality, between summer and winter variations of obal radiation and equivalent temperature and mortality, etc. are discussed with the aid of raphs. *Subject Headings:* **1. Weather effects and diseases 2. Medical meteorology.**—*I.L.D.*

10.10–119 551.555.3:551.586:61

†Undt, W. (*Vienna*), **Meteorologie des Föhns.** [Meteorology of föhn.] *Annalen der Meteorologie, Medizin-Meteorologische Hefte*, No. 13:97–111, 180, **1958.** Bibliog. p. 106–111, 30. **DWB**—A comprehensive review of the literature on the meteorological characteristics of hn with particular attention to their aspects that are significant in medical meteorology. he contents of this review include the following: a brief historical account of föhn studies om J. Esöy and H. W. Dove to the present; various definitions of föhn; the criteria of föhn, amely: dynamic warming reduction in relative humidity, wind direction and gustiness; and ecific cloud formations; local modification of föhn by topography, atmospheric conditions, ne occurrence of anticyclonic föhn, cold föhn, the consequent phenomena of transitional or arginal föhn and föhn classification scale; a detailed review of the variation of air temperature, lative humidity, wind speed, ozone concentration, and barometric pressure during föhn, and f various accompanying föhn phenomena such as atmospheric electricity, solar radiation and lteration in the properties of colloidal solutions; statistics on the geographic incidence of föhn; nd daily and annual variation of föhn incidence. *Subject Headings:* **1. Föhn weather 2. Medcal meteorology 3. Föhn bibliographies.**—*I.L.D.*

10.10–120 551.586:61

Picko, V., **Die Dynamik des Ganges meteorologischer Elemente und die Krankheiten.** The dynamics of the course of meteorological elements and illnesses.] *Angewandte Meteorogie*, 3(2):51–59, **1957.** 5 figs., 2 tables, 12 refs., 4 eqs. **DLC**—The generally applied methods f relating meteorological elements to the incidence of disease, as for example, mean daily emperatures, absolute values of temperature at fixed hours, barometric tendency, etc. are eviewed critically and the errors arising from such procedures are stressed. The author levelops a method for using normal means of meteorological elements and the interdiurnal leviation from them for expressing the variation in the meteorological elements to which arious disease occurrences are related. A normal mean is taken and it constitutes the zero ase line for a 10-day period. The deviations from this normal mean are plotted and the rends manifested by the resulting curve are subjected to a two-fold analysis. The angle ormed by the curve with the horizontal level is used to express the intensity of the physiological ffect of the meteorological elements at specified multiples of 24 hours and the velocity and cceleration of the curve (i.e., the first and second derivative) are used to relate the frequency f disease to the dynamics of the meteorological elements. The application of this procedure s illustrated by the relationship of temperature and barometric pressure to diseases of the pper respiratory passages, glaucoma with pressure and nonspecific iritis. *Subject Heading:* **1. Medical meteorology.**—*I.L.D.*

10.10–121 551.586:616

Kamiyama, K.; Kashiwagi, T. (*both, Met. Res. Inst. J.M.A., Tokyo*) and Nashimoto, I. (*Tokyo Medical and Dental Univ.*), **A rheumatic and his relation to weather conditions.** *Geophysical Magazine*, Tokyo, 28(4):517–532, Sept. **1958.** 9 figs., 8 tables, 5 refs., eqs. **DWB, DLC**—A rheumatic patient of the Yugawara Orthopedic Hospital, Yugawara Spa, Kanagawa Prefecture, was selected for observation of his vasomotor reflex by the plethysmogram, neck skin temperature, thumb skin temperature, number of purpura and excreted hexosamine in urine, from 22 May through 17 June 1957. Repeatedly exposing the patient's neck to the wind after applying a light, a conditioned state was established, and thus the plethysmogram showed that the same vasomotor constriction was produced by use of a light alone as by exposure to the wind, and at the same time that the occurrence of conditioned state was strengthened before the passing of the trough. Calculating the correlation coefficient between skin temperature and effective temperature, and between the amplitude of the plethysmogram and effective temperature, the correlation coefficient of a healthy person was larger than that of

the patient. After repeatedly mopping the patient's neck with a wet towel while he w listening to the sound of water dropping, the same vasomotor reflex would be produced wit dropping sound only as with mopping with a wet towel. When the conditioned reflex ma by the sound of water dropping was occurring, then the reflex by light was produced als With the observation of the vasomotor reflex, the change in excreted hexosamine in urine component of glucoprotein) was daily investigated. The result showed that the excret amount of the patient was a little larger than that of a healthy person. The excreted hex samine in urine showed great correlation coefficient with the difference between dry bulb an wet-bulb temperature, and it was proved that the mean excreted amount was at the minimu a day before the passing of the trough. *Subject Headings:* **1. Weather effects on rheumatis 2. Vasomotor reflexes 3. Kanagawa Prefecture, Japan. I. Kubota, T. II. Yamaguchi, III. Hamada, B. IV. Wakiya, T.**—*Authors' abstract.*

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION

See also: **Weather Radar Conf., Miami, 1958,** 10.10–7; **Upper air wind measurement techniques** (Hudson et al.), 10.10–26; **Instructions for climat. observers,** 10.10–40; **Weather station supervision,** 10.10–42; **Instructions for hydromet. observers,** 10.10–43; **Met. network, Kirovograd** (Guk), 10.10–61; **Telemetering system for water temp. measurement** (Benditskiĭ), 10.10–71; **Wave photography with a grid nomogram** (Levchenko), 10.10–74; **Rocket obs. techniques** (Izakov, Kokin), 10.10–156; **Temp. instrument comparisons** (Lettau), 10.10–160; **Radiation obs.** (Savikovskiĭ), 10.10–246; **Aircraft obs. of nuclei** (Durbin), 10.10–284; **Condensation nuclei measurement** (Georgii), 10.10–288.

10.10–122 551.501:551.507.321.2:551.508.5

Guterman, I. G., **O sovmestnoĭ obrabotke sharopilotnykh i radiopilotnykh nabliudeni dlia tseleĭ aeroklimatologii.** [Simultaneous analysis of pilot balloon and rawin observation for aeroclimatological purposes.] *Tashkent. Geofizicheskaia Observatoriia, Trudy,* No. 11/12 59–61, **1956.** table. **DLC**—A comparison of 246 cases of simultaneous observations of wind made by means of pilot balloons and rawins shows that mean data obtained by both method are comparable. *Subject Headings:* **1. Pilot balloon data analysis 2. Rawin data analysis 3. Wind observation techniques.**—*A.M.P.*

10.10–123 551.501.4:551.501.72

Gel'mgol'ts, N. F., **O metodike privedeniia srednikh aerologicheskikh velichin k mnogo letnim normam.** [Method of reducing mean aerological values to long-period norms.] *Tash kent. Geofizicheskaia Observatoriia, Trudy,* No. 11/12:45–49, **1956.** 3 figs., table. **DLC**—Th reduction of mean aerological data has to be carried out separately for the morning and evenin observations for long-period (13–18 year) norms. The mean monthly temperatures (24 hour are usually reduced to the period 1881–1935. *Subject Headings:* **1. Upper air data analysis 2. Reduction methods.**—*A.M.P.*

10.10–124 551.501.4:551.5

Lettau, Heinz H. (*Geophysics Research Directorate*), **Representative wind components a standard levels.** (In: Lettau, H. H. and Davidson, Ben (*eds.*), **Exploring the atmosphere' first mile.** N. Y. Pergamon Press, **1957.** Vol. 1:303.) **DWB**—The author describes th procedures employed to plot profiles of west and south components of wind from the result of the daytime Loeser technique; to obtain rawin data for standard heights; to compute doubl theodolite data at standard levels, etc. *Subject Headings:* **1. Wind components 2. Win analysis.**—*I.L.D.*

10.10–125 551.501.4:551.579:551.509.5

Popov, E. G., **Osnovy rascheta zaderzhaniia talykh vod v rechnykh basseĭnakh.** [Prin ciples of the calculation of retention of meltwater in river basins.] *Moscow. Tsentral'ny*

stitut Prognozov, Trudy, No. 24(51):10–42, 1951. 17 figs., 5 tables, 4 refs., 52 eqs. **DWB**—sing the laws of surface runoff, the author presents a theoretical basis for computing the tention of water in river basins, with particular reference to forecasting the elements of spring ods. The relationship of the surface retention of water to the structure of the surface of a ver basin, its water permeability and the amount of snowfall or liquid precipitation is analyzed th the aid of numerical data and theoretical equations, which describe the process of water tention for the most simple cases, namely, a water impermeable basin and a basin with an derlying water permeable surface. Also the effects of swampiness and water permeability soils upon the water absorption capacities of river basins are considered. In the theoretical alysis of the process of surface retention in a real river basin the simplest case is that of mplete absence of absorption by infiltration; the total retention layer for a nonpermeable ater basin is given by

$$P_0 = \int_0^{s=x} S \cdot \varphi(S)dS + \left[1 - \int_0^{s=x} \varphi(S)dS\right] x$$

d the total runoff

$$y = x \int_0^{s=x} \varphi(S)dS - \int_0^{s=x} S \cdot \varphi(S)dS.$$

or a water permeable basin

$$P = \int_0^{s=[1-(i/h)]x} S \cdot \varphi(S)dS + \left(1 - \frac{1}{h}\right)\left[1 - \int_0^{s=x} \varphi(S)dS\right] x$$

nd

$$y = x\left(1 - \frac{i}{h}\right)\int_0^{s=x} \varphi(S)dS - \int_0^{s=[1-(i/h)]x} S \cdot \varphi(S)dS$$

hich give the total runoff layer for a water permeable basin with constant intensity of in-ltration. By differentiating those equations with respect to time, equations are obtained for he intensity of water retention and water yield as a function of the intensity of snow melt, nfiltration and total melt snow. Computation of water retention and water yield on the basis f these equations and values of the computed coefficients are presented and the possible pplication of water absorption and yield by river basins for forecasting runoff is illustrated ith the aid of relevant equations and graphs. *Subject Headings:* **1. Surface water retention omputation 2. Runoff forecasting.**—*I.L.D.*

10.10–126 551.501.42:551.524.4

Deguillaume, Marc, **Une application de la formule barométrique à l'étude des variations e température des couches d'air voisines du sol.** [An application of the barometric formula o the study of temperature changes in the layers of air near the ground.] *L'Astronomie*, aris, 73(1):31–33, Jan. 1959. **DLC**—LAPLACE'S simplified barometric formula makes it ossible to specify the law which connects pressure modifications (at ground level and in ltitude) to changes of the air temperature within the lower layers of the atmosphere, from round level up to the fixed level. The author discusses the change of the mean temperature f the column of air lifting from ground level z_0 to the fixed level z_1, on account of known changes f atmospheric pressure, thanks to the relation

$$\frac{mg}{R}\int_{z0}^{z_1} \frac{\Delta T}{T(T+\Delta T)}\,dz = L\left[\frac{1+\dfrac{\Delta p_1}{p_1}}{1+\dfrac{\Delta p_0}{p_0}}\right]$$

here: m = mass of the particle of air; g = gravity acceleration; R = constant of perfect gases; = absolute temperature of a particle situated at one or other point of the column of air; = atmospheric pressure; z = altitude. The indexes 0 and 1 concern the ground level and the xed level respectively. *Subject Headings:* **1. Barometric formulas 2. Air temperature . Air layers near the ground.**—*A.V.*

10.10–127 551.501.7:551.513.2:551.557

†Dzhordzhio, V. A., **O postroenii srednikh vertikal'nykh razrezov s tsel'iu izucheni struĭnogo techeniia i drugikh osobennosteĭ obshcheĭ tsirkuliatsii atmosfery.** [Constructio of mean vertical cross sections for studying the jet stream and other characteristics of genen atmospheric circulation.] *Tashkent. Geofizicheskaia Observatoriia, Trudy*, No. 11/12:87–11 **1956.** 18 figs., 4 tables, 41 refs. **DLC**—A detailed review of the progress achieved since 19 in the field of construction and analysis of mean vertical cross sections and an outline of tas facing Soviet climatography in connection with the IGY program on cross sections. Thr periods—1931–1941, 1941–1952, and 1953 and since—are recognized with the first perio briefly mentioned. The achievements of the second period—the construction of cross sectio along chosen meridians, introduction of the western and eastern wind components in cro sections, the use of the pressure logarithm as a vertical coordinate, the plotting of humidi data in the cross sections, the discovery of the jet stream, the tropopause bi-section along th jet stream, the whole complex phenomena known under the concept of planetary upper front zone—are taken up in great detail—as well as the most important cross sections constructe in 1953–1954 in which the mean characteristics of the jet stream were studied on the bas of various cross sections made mostly by western investigators. *Subject Headings:* **1. Aero logical cross sections 2. Jet stream studies 3. General circulation studies.**—*A.M.P.*

10.10–128 551.501

Gel'mgol'ts, N. F., **O trebovaniiakh, pred"iavliaemykh k riadam aerologicheskikh nabliudeniĭ dlia polucheniia srednikh velichin zadannoĭ tochnosti.** [Requirements of a seri of aerological observations to obtain mean values of a given accuracy.] *Tashkent. Ge fizicheskaia Observatoriia, Trudy*, No. 11/12:25–33, **1956.** 4 tables, 8 eqs. **DLC**—The proble of the quantity of aerological observations which is necessary for obtaining mean values of th desired accuracy is examined on the basis of a mathematical formula showing that the necessar quantity is directly proportional to the dispersion of the total population—the greater th dispersion of the data in the total population the larger must be the quantity of observation *Subject Heading:* **1. Upper air observation requirements.**—*A.M.P.*

10.10–129 551.501.7:551.524.7:551.51

Gião, A. and Roulleau, J., **Sur le calcul du gradient thermique vertical dans l'atmosphère** [Calculation of the vertical thermal gradient in the atmosphere.] *Académie des Science Paris, Comptes Rendus*, 247(25):2407–2409, Dec. 22, **1958.** 7 eqs. **DWB, DLC**—Taking int account on the one hand the definition of entropy, and on the other hand elementary geo metrical considerations, the authors show that in the case of a normal and almost barotropi motion, the adiabatic vertical thermal gradient may be expressed by the following formula:

$$\frac{\partial T}{\partial Z} = -\frac{g}{2Cp}\left[1+\frac{tg\epsilon}{tg\gamma}-\frac{1}{2tg\gamma}\,(tg\alpha+tg\gamma)\right]$$

where T = absolute temperature, g = acceleration of gravity, Cp = specific heat under constan pressure and α, γ and ϵ = the gradient angles of the isentropic, isothermal and isobaric surface The mean value of the vertical thermal gradient in an almost barotropic atmosphere must b comprised between the standard value of the adiabatic vertical gradient and one half of it *Subject Heading:* **1. Vertical thermal gradient.**—*A.V.*

10.10–130 551.501.7:681.17

Lobanova, V. Ia., **Mekhanizirovannaia obrabotka aerologicheskikh nabliudeniĭ.** [Mech anized analysis of aerological observations.] *Tashkent. Geofizicheskaia Observatoriia, Trudy* No. 11/12:10–13, **1956.** 2 tables. **DLC**—The methods of transferring upper wind and tem perature sounding data from tables onto punch cards, the creation of punch card indexes an the mechanized processing of such punch cards are discussed in detail. *Subject Headings* **1. Upper air data analysis 2. Punched card methods.**—*A.M.P.*

10.10–131 551.501.7:551.506.7:551.508.822

Mani, Anna and Venkataraman, C. N. (*both, Met. Office, Poona*), **An improved method of computation of upper air data from F-type radiosonde observations.** *Indian Journal of Meteorology and Geophysics*, Delhi, 9(3):292, July 1958. table, ref. **DWB, DLC**—The present methods of computing upper air data from the recorded observations of the F-type radiosonde are enumerated. A brief description of the new method that eliminates sources of personal errors is given. The application of the new method is illustrated in the temperature data obtained at Payerne on May 28, 1956 during the international comparison of radiosondes. *Subject Headings:* **1. Upper air computation 2. Radiosonde data processing.**—*N.N.*

10.10–132 551.501.7:551.506.7:551.508.822

Veĭdner, I. N., **Vozmozhnost' i metody sovmestnoĭ obrabotki radiozondovykh i samoletnykh pod"emov.** [The possibility and methods for analyzing simultaneously radio and airplane soundings.] *Tashkent. Geofizicheskaia Observatoriia, Trudy*, No. 11/12:80–86, 1956. 2 tables, 4 refs. **DLC**—Differences in methods and results of radio and airplane upper air soundings can be explained by differences in: 1. location of sounding points, 2. accuracy of sounding methods and instruments, 3. weather conditions (airplanes do not take off in bad weather), 4. time duration needed to reach the appropriate altitude, 5. time table of soundings. However, it would be possible to analyze the soundings simultaneously if a method suggested by the author is adopted. *Subject Headings:* **1. Airplane soundings 2. Upper air soundings 3. Simultaneous radiosonde-airplane data analysis.**—*A.M.P.*

10.10–133 551.501.721:551.507.362.2:551.521.67

Van Allen, J. A.; Ludwig, G. H.; Ray, E. C. and McIlwain, C. E., **Observation of high intensity radiation by satellites 1958 Alpha and Gamma (1958).** 19 p. 8 figs., table. Mimeo. Assisted by U. S./I.G.Y. Project 32.1 of the National Academy of Sciences and the National Science Foundation.—A preliminary report is given of the results obtained in measurements of radiation intensities by artificial earth satellites Explorers I and III and of several geophysical effects, by means of a single Geiger Mueller tube, a scaling circuit for reducing the number of pulses to be worked with, and telemetering systems used for transmitting the scalar output to the ground receiving stations. *Subject Headings:* **1. Van Allen radiation belt 2. Satellite radiation measurement.**—*N.N.*

10.10–134 551.501.724:551.524.7

Gel'mgol'ts, N. F., **O metodike aeroklimaticheskikh razrabotok po materialam temperaturnogo zondirovaniia.** [A method of aeroclimatological analysis of temperature sounding data.] *Tashkent. Geofizicheskaia Observatoriia, Trudy*, No. 11/12:34–44, 1956. 4 tables, eqs. **DLC**—The problem of calculating mean temperatures in the upper atmosphere is treated. The methods of differentiation and of averaging are discussed. It has been found that temperatures obtained by the first method are distinguished by a greater quadratic error than by simple means, that temperatures are usually below the actual temperature, especially in the cold season, and that the method of differentiation is much more complicated than the method of averaging. Concludes that the method of differentiation is not expedient. *Subject Heading:* **1. Upper air temperature data analysis.**—*A.M.P.*

10.10–135 551.501.724:551.524.7

Nakorenko, N. F., **Oznovnye trebovaniia, kotorym dolzhna udovletvoriat' metodika obrabotki temperatury na vysotakh, i metod obrabotki predlozhennyĭ GGO.** [Basic requirements of a method of upper air temperature analysis and a method of temperature analysis proposed by the Main Geophysical Observatory.] *Tashkent. Geofizicheskaia Observatoriia, Trudy*, No. 11/12:18–24, 1956. 1 fig., eqs. **DLC**—Since a large number of air temperature analyses sent to the main Geophysical Observatory for review contain errors and inconsistencies due to erroneous methods of analyzing, the author explains the method of analyzing used at the M.G.O. to obtain a curve of mean temperature with height including the tropopause, and points out that: 1) simple calculations can be used for the troposphere when the number of observations decreases insignificantly with height; 2) the mean temperature should be

obtained for many years, i.e., a reduction of temperature is necessary and 3) the height and temperature of the tropopause must agree with the troposphere temperature and constitute an integral part of the temperature change curve. *Subject Heading:* **1. Upper air temperature analysis.**—*A.M.P.*

10.10–136 551.501.724:551.524.73

Veĭdner, I. N., **O metodike vychisleniia srednikh aeroklimatograficheskikh kharakteristik po dannym, poluchennym v razlichnye sroki zondirovaniia.** [A method for calculating mean aeroclimatographic characteristics from data obtained during varying sounding periods.] *Tashkent. Geofizicheskaia Observatoriia, Trudy*, No. 11/12:75–79, **1956.** **DLC**—In order to determine the possible extent of distortions that could be brought into the determination of aeroclimatic characteristics by upper air soundings made at various hours of the day, an analysis of diurnal temperature variation at various heights (1–10 km) was carried out from April 20 to May 20, 1954 at Tashkent. It was found that in the cold period (November–March) soundings made 3 hrs or less in advance of the standard observation time will not distort the mean temperature data. In the warm period morning and evening observations made at various hours can be used if the mean weighted observation time coincides with the standard time. *Subject Headings:* **1. Upper air data analysis 2. Diurnal upper air temperature variations 3. Tashkent, Uzbek SSR.**—*A.M.P.*

10.10–137 551.501.75:551.557:551.542.1

Lamp, Werner, **Geostrophischer und zyklostrophischer Gradientwindzirkel.** [Geostrophic and cyclostrophic gradient wind protractor.] *Meteorologische Rundschau*, Berlin, 11(2):57–60, March/April **1958.** 4 figs., 3 tables, eqs. **DWB, DLC**—A description of a geostrophic wind measure and nomogram developed by the U. S. Air Weather Service. It is based upon a compass, one arm of which is the scale (latitude lines as curves and wind velocities as straight lines) and the other arm of the compass is the reading line. The distance between the vertices of the arms represents the interval between isohypses for a given latitude and wind velocity. The construction of a gradient wind protractor for analyzing weather maps of the Lambert projection with a scale of $1:5\times10^6$ and an isohypse interval of 30 m (100 ft) or with a scale of $1:10\times10^6$ and an isohypse distance of 60 m (200 ft) is described with the aid of diagrams and equations. The formulas for computing radii for the latitude circles and coordinate (in mm) for the individual intersection points (latitude circles/velocities) are presented and computed values of these are given in tables. Also tables with the distance N_Z in mm (scale $1:5\times10^6$ and maximum of wind velocities in meters/second and knots for different geographic latitudes and different radii) are presented. *Subject Headings:* **1. Gradient wind protractors 2. Geostrophic wind scale 3. Cyclostrophic wind scale.**—*I.L.D.*

10.10–138 551.501.75:551.553.6

Nakorenko, N. F., **Rezul'taty proverki i obrabotki vetra metodom raznostei.** [Results of a verification of wind analysis by the method of differences.] *Tashkent. Geofizicheskaia Observatoriia, Trudy*, No. 11/12:54–58, **1956.** 6 tables. **DLC**—The results of a detailed verification presented in this paper show that the method of differences overestimates somewhat the wind velocities in winter and autumn, and minimizes them in spring and summer. Wind roses obtained by the method of differences give a fairly true picture of the frequency distribution of wind direction, while the method of simple calculations distorts the actual picture. *Subject Headings:* **1. Wind analysis 2. Difference method of averaging 3. Wind velocities.**—*A.M.P.*

10.10–139 551.501.774:551.579.2

Kharshan, Sh. A., **O raschetakh talogo stoka v gornykh basseĭnakh.** [Calculation of meltwater runoff in mountain basins.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, No. 44(71):76–88, **1956.** 3 figs., 4 tables, 5 refs., 5 eqs. **DWB**—The method of calculating melt water runoff in mountain basins is based upon the equation $I_i = kt_iF_i$, where k = coefficient of melting; F_i = area of the zone in which melting occurs; t_i = mean air temperature for this area. The amount of melt water formed in the basin in the case of γ (vertical temperature gradient)

c=constant, k=constant and n=constant is given by the formula

$$I = k\eta \sum_{H_1}^{H_2} F_i[t_0 + \gamma(H_1 - H_0)]$$

where H_1 and H_2 are lower and upper boundaries of snow melting zone, respectively, determined according to the position of the zero isotherm, t_1=air temperature at the station. The calculation of the height of the snow line in the absence of adequate data on reserves of water in the snow cover involves the following: computation of the index of water reserves in the snow cover (module coefficient) for individual high altitude zones; determination of the rates of module coefficient of water reserves in snow cover (m) to sum of positive mean daily air temperatures (Σt_+) accumulated for period of snow melt in these zones $M = m/\Sigma t_+$; computation of sum of positive air temperatures necessary for melting snow on individual zones $\Sigma t_+ = m/M$; and calculation of dates of end of snow melt for each zone from data on air temperature. The calculation of melt water of the Iagnob Darya (Zeravshan River basin) is presented. The usefulness of utilizing the computed distribution of snow reserves in mountain zones in forecasting runoff during the vegetation period is indicated. *Subject Headings:* **1. Snow melt runoff calculation 2. Snow-runoff correlations.**—*I.L.D.*

10.10–140 551.501.81:551.551.5:551.576.11

Gorelik, A. G.; Kostarev, V. V. and Chernikov, A. A., **Radiolokatsionnoe izmerenie turbulentnykh dvizheniĭ v oblakakh.** [Radar measurement of turbulent motions in clouds.] *Meteorologiia i Gidrologiia*, Leningrad, No. 5:12–19, **1958.** 4 figs., 2 refs., 17 eqs. **DWB, DLC.** English transl. by Valda Dreimanis, edited by David Atlas, issued by American Meteorological Society under Contract AF 19(604)-1936, Aug. **1958.** (13 p.)—The authors describe some radar observations based upon the use of noninertial recording of the amplitudes of successive single radio echo impulses. The principle of radar determination of turbulence in clouds is described with the aid of a diagram. During the time between successive impulse soundings the mutual position of particles within the discharging body varies. The phase relationship in the signal received, and hence its magnitude at the outlet of the receiver, is accordingly altered. The fluctuations of the outgoing signal are determined by the chaotic movement of particles. By recording the variation of successive amplitudes of the radar echo signal it is possible to determine the maximum and mean square rate of chaotic movements. The relationship between the fluctuations of the amplitudes of the sequence of reflected signals and the mean square velocity of chaotic movements of dispersed particles is established on the basis of a theory developed in investigations of the statistical nature of the ionosphere (Al'pert, Ia. L., **O statisticheskoĭ prirode ionosfery, 49, 1953 [Statistical nature of the ionosphere].** *Uspekhi Fizicheskikh Nauk*, v. 49, **1953**). The radar signal from an emitting cloud is written as

$$A = a_0 \cos \omega_0 t + \sum_1^N a_s \cos(\omega_s t - \varphi_s),$$

where $a_0 \cos \omega_0 t$=total signal of the particles, not displaced along the direction of extension, $\omega_0 = 2\pi f_0$=frequency of probing impulse; a_0, ω_s, φ_s=random amplitude, frequency and phase of the signal reflected from the moving particles. The derivation of the equation for computing the mean chaotic velocity (v_1), namely

$$v_0 = \frac{\lambda \sqrt{|R_n - R_{n+1}|}}{4\pi \Delta t \sqrt{a_0^2 w_0 + 2w_0^2}}$$

(where Δt=period of the frequency of probing impulses, R_n and R_{n+1}=two successive amplitude values of the signal), is developed. The values a_0 and w_0 are determined from the equations $a_0 = \sqrt{2R^2 - (\bar{R})^2}$ and $w_0 = \bar{R}^2 - (\bar{R})^2$. An experiment for measuring the vertical chaotic motion in clouds by the use of radar stations of centimeter range is described with the aid of a block diagram of a noninertial recorder of successively reflected impulses. The results showed that the distribution of amplitudes of the signal received agrees with theoretical

expectations. Usually the signal has a distribution differing from the Rayleigh distribution The method of noninertial recording provides supplementary data on the physical properties of the meteorological sources of radar signals, namely the observations at a distance of chaotic motions characterizing the turbulent state of clouds. *Subject Headings:* **1. Radar turbulence measurement 2. Radar echo interpretation 3. Turbulence in clouds.**—*I.L.D.*

10.10–141 551.501.81:551.577.2

Hiser, H. W. and Senn, H. V. (*both, Marine Lab., Univ. Miami*) and Conover, L. F. (*Hydrologic Services Div., U. S. W. B.*), **Rainfall measurement by radar using photographic integration techniques.** *American Geophysical Union, Transactions*, 39(6):1043–1047, Dec. **1958.** 2 figs., table, 5 refs., 2 eqs. **DWB, DLC**—Methods have been devised to estimate area rainfall amounts as portrayed by radar. This is accomplished by a continuous photographic integration of the plan position indicator (PPI) scope over periods of one or more hours giving the hydrologist almost immediate information on the precipitation falling on an area of over 30,000 sq mi. These investigations have developed echo-density contour maps which correlate favorably with isohyetal maps. The limitations and capabilities of present radar systems for purposes of radar integration of rainfall also have been evaluated. *Subject Headings:* **1. Radar rainfall measurements 2. Areal precipitation estimation 3. Radar photographs.**—*Author's abstract.*

10.10–142 551.501.81:551.515.3(781)

Sadowski, Alexander (*U. S. W. B., Wash., D. C.*), **Radar observations of the El Dorado, Kans. tornado, June 10, 1958.** *Monthly Weather Review*, Wash., D. C., 86(10):405–407, Oct. **1958.** 3 figs. **DWB, DLC**—This note on the tornado that struck El Dorado, Kans., on June 10, 1958, deals primarily with the radar scope presentations of the cloud echo and is based on the personal observations of the author who was operating the WSR-3 radar at Weather Bureau Airport Station, Wichita, Kans. A sequence of radar photographs and a description of radar features observed but not photographed are presented. A well-formed hook of short duration in the right rear quadrant of the echo is one of the main features evident in the photographic sequence. The presentation of the radar observations is preceded by a brief summary of the synoptic conditions with which the storm was associated. *Subject Headings:* **1. Radar observation of tornadoes 2. Radar echoes from clouds 3. Tornado, El Dorado, Kans. (June 10, 1958) 4. El Dorado, Kans.**—*Author's introduction.*

OBSERVATIONAL DATA

See also: **IGY data analysis,** 10.10–1; **Ground temp. data** (Chang), 10.10–25; **Soviet Bloc IGY Information,** 10.10–44; **IGY program** (Kort), 10.10–47; **IGY program** (Buedeler), 10.10–49; **IGY glaciology program** (Bader), 10.10–50; **Soviet Antarc. IGY expeditions** (Suziumov), 10.10–56; **IGY satellite program** (Easton, Votaw), 10.10–92; **IGY auroral program** (Adem), 10.10–94; **IGY satellite program** (Adams et al.), 10.10–95; **Upper air data computation** (Mani, Venkataraman), 10.10–131; **Simultaneous radiosonde-airplane data analysis** (Veĭdner), 10.10–132.

10.10–143 551.506.3:551.524(481)

*Norway. Meteorologiske Institutt, **Lufttemperaturen i Norge, 1861–1955.** [Air temperature in Norway, 1861–1955.] Oslo, H. Aschehoug, May **1957.** 2 vol. Vol. 1 (288 p.), **Middelverdier** (Mean values). 88 p. of text. Numerous tables, map, 12 charts. Vol. 2 (356 p.), **Måneds- og årsmiddeltemperaturer, maksimums- og minimums-temperaturer** [Mean monthly and annual air temperature, maximum and minimum temperature]. Almost entirely tables. **DWB** (M82.2/481 N892Lu)—Voluminous and detailed mean or contingency tables of many temperature elements for period 1901–30 or for the period of record during 1861–1955, with 88 pages of discussion of material and of tables for about 300 stations in Norway. A list of stations is given alphabetically and by counties. Mean monthly and annual air temp. for 1901–30, 5-day means of air temp. for 1901–30, average dates when temp. went above 0°, 6° and 10°C, degree days, 14 h temp., highest and lowest temp., frost, standard deviation of mean monthly temperature, overlapping 30 year means, description of stations

and charts of vertical gradient of temperature in mountains in each month are included. *Subject Headings:* **1. Temperature data, Norway 2. Norway.**—*M.R.*

10.10–144 551.506.1(675)

*Belgian Congo. Service Météorologique, **Annuaire Météorologique 1958 du Congo belge et du Ruanda-Urundi.** [Meteorological yearbook for 1958 for Belgian Congo and Ruanda-Urundi.] *Belgium. Académie Royale des Sciences Coloniales. Classe des Sciences Techniques, Mémoires in* —8°, n. s., 8(2), **1958.** 187 p. tables. Also: **Yearbook for 1959.** *Ibid.*, 8(5), **1958.** 162 p. charts, tables. Also: **Yearbook for 1960.** *Ibid.*, 12(1), **1959.** 158 p. tables. **DWB**—The 1958 Yearbook contains the times of sunrise, sunset, moonrise and moonset for some place in the Belgian Congo and Ruanda-Urundi; the eclipses and planets in 1958; the astronomical phenomena for the year 1958 and the southings of planets. Climatological data of the Belgian Congo including monthly values of air temperature, atmospheric pressure, relative humidity, precipitation and sunshine for about twenty stations are included as well as hourly monthly values of solar global radiation, the diffuse radiation of the sky and the direct solar radiation measured on a surface perpendicular to the incident rays. Similar material will be found in the 1959 and 1960 Yearbooks. *Subject Headings:* **1. Yearbooks 2. Meteorological data 3. Astronomical data 4. Belgian Congo 5. Ruanda-Urundi.**—*A.V.*

10.10–145 551.506.1(471.1)

*Finland. Ilmatieteellinen Keskusliaitos, **Ilmatieteeliset Havainnot Suomessa** [Meteorological observations in Finland], **1944 and 1945,** both issued **1956.** 2 pieces, each about 75 p. Almost entirely tables. Its *Suomen Meteorologinen Vuosikirja*, 44(1) and 45(1), **1944** and **1945.** (For issues for 1940–1943, *see* 8.10–95, Oct. 1957, *MAB.*) **DLC** (QC989.R5F5)—Continuation of series of annuals giving results of meteorological recordings at Ilmala Observatory, and daily summaries of usual synoptic elements at 6 stations, plus monthly and annual summaries at 100 second and third order stations. Data for Ilmala include 2 hourly values of pressure, temperature, relative humidity, wind direction and speed, cloud and cloud height, visibility, sunshine, precipitation, hydrometeors, vapor pressure, etc. *Subject Headings:* **1. Annual meteorological data summaries 2. Finland. I. Rossi, V. II. Kolkki, O.**—*M.R.*

10.10–146 551.506.1(667/8)

*French Togoland. Service Météorologique, **Résumé mensuel du temps au Togo** [Monthly summary of weather at Togo], April **1957.** 14 p. mostly tables. Mimeo. **DWB,** —The monthly report contains a verbal summary of weather in Togoland during the month, tables giving the basic climatic elements for the entire network, and more detailed daily, or 3 times daily, data for the synoptic and airways reporting station at Lomé Airdrome. The latter includes frequency of clouds, ceilings, visibilities and winds, plus daily upper air winds at 500, 1500, 2000, 3000, 4000 and 5000 m. Two precipitation charts show the total and the percentage of normal precipitation for the month. Sea surface temperature for Lomé and vapor pressure, evaporation, sunshine and soil temperature data for several stations are also given. *Subject Headings:* **1. Monthly meteorological data summaries 2. Upper air wind data 3. French Togo.**—*M.R.*

10.10–147 551.506.1(437.6)(058)

*Hurbanovo, Czechoslovakia. Observatoria, **Ročenka poveternostných pozorovaní** [Yearbook of meteorological observations], **1953–1954.** 1 piece (172 p.). Almost entirely tables. *Czechoslovakia. Hydrometeorologický Ústav, Publikácia, Ser. A*, Vol. 9–10, **1953–1954,** pub. **1958. DLC**(?)—Hourly, thrice daily or daily, monthly and annual pressure, temperature, grass minimum, evaporation (WILD), vapor pressure, cloud and weather, precipitation, state of soil, departure from normal (1876–1935), soil temperature (LAMONT) at 50, 100, 150 and 200 cm, actinograph (ROBITZSCH), sunshine duration and other data for Hurbanovo (STARA ĎALA), Slovakia 47°52′N, 18°12′E, alt. 120 m. *Subject Headings:* **1. Annual meteorological data summaries 2. Observational data 3. Soil temperature data 4. Solar radiation data 5. Evaporation data 6. Hurbanovo, Slovakia.**—*M.R.*

10.10–148 551.506.1(469)(058)

*Portugal. Serviço Meteorológico Nacional, **Anuario Climatológico de Portugal, Pt. 1, Continente e Ilhas do Atlântico-Norte: Observações de superficie** [Climatological annual of Portugal, Pt. 1, Continent and isles of the North Atlantic: surface observations], Vol. 10, **1956**; Vol. 11, **1957**; Vol. 12, **1958.** pub. **1957, 1958, 1959.** about 140 p. each. Mostly tables. **DWB**—Tables give 3 times daily and daily values of pressure, temperature, relative humidity, visibility, cloud amount, sunshine, state of ground precipitation, evaporation and miscellaneous data for Lisbon, Ponta Delgada, S. Miguel, Funchal-Madeira, Mindello, S. Vicente; plus extensive monthly and annual summaries for 110 stations in continental Portugal, 12 in the Azores, 11 on Madeira, 14 on Cape Verde; plus precipitation data for >500 stations, global radiation data for 15 stations (among them 10 with Robitzsch, 2 with Moll-Gorczyński, and 2 with Eppley pyrheliometers) giving total monthly, maximum daily each month and the date thereof in *ly*, and water temperature data for 9 stations. *Subject Headings:* **1. Annual meteorological data summaries 2. Solar radiation data 3. Observational data 4. Water temperature data 5. Evaporation data 6. Portugal 7. Madeira.**—*M.R.*

10.10–149 551.506.1:551.577:058(497.1)

*Yugoslavia. Hidrometeorološka Služba, **Meteorološki Godišnjak, 1950, II, Padavine.** [Meteorological Yearbook, 1950, Pt. 2, Precipitation.] pub. **1954.** Latest issue seen, 1952, pub. **1956.** Annual (publication date irregular for earlier issues). paging varies (1952 issue, 191 p.). Almost entirely tables. Title-page, contents and preface in French and Croatian. Title varies: 1941–1949 as **Izveštaj o Padavinama** (which was continuation in part of its earlier **Izvestaj o Vodenim Talozima, Vodostajimai Količinama Vode**). **DLC, DWB** (broken)—This extensive and voluminous compilation of daily, monthly and annual precip. data is arranged by stations in the years up to 1949, and by Republics (Serbia, Croatia, Slovenia, Macedonia, Bosnia-Herzegovina, etc.) and by months in the later years (1950+). The number of stations represented increases steadily from 372 in 1946 to >900 in 1948/49 and to >1600 in the 1952 yearbook. The basic data are: 1) station locations and coordinates; 2) daily and monthly precip.; 3) number of days with precip., with snow and with snow on ground; 4) mean monthly and annual precip. for period 1925–40. An annual (Wonthly) summary is also included listing data for each station. *Subject Headings:* **1. Annual precipitation summaries 2. Meteorological yearbooks 3. Yugoslavia.**—*M.R.*

10.10–150 551.506.3(68) 551.577.2(68)

*South Africa. Weather Bureau, **Klimaat van Suid-Afrika, deel 4, Rëenvalkaarte.** [Climate of South Africa, Pt. 4, Rainfall maps.] Its *WB* 22, June **1957.** 3+20 p. 32 maps, tables, 2 maps (fold.). In Afrikaans and English. **DWB** (M82.2/68 S726k).—Continuing the climatic data analysis for South Africa, this fourth volume contains maps of annual, seasonal and monthly normal precipitation, a map with diagrams for each station (monthly normals, maximum and minimum), maps of frequency, variability, reliability of rainfall, etc. The maps are colored to show the orography. (For abstracts on Pts. 1–3, *see* 7.4–96, 7.4–97 and 9.8–109, April 1956 and Aug. 1958, *MAB.*) *Subject Headings:* **1. Climate of South Africa 2. Rainfall charts 3. South Africa.**—*G.T.*

10.10–151 551.506.7:551.507.321.2:551.557(265)

*Angell, James K. (*U. S. Weather Bureau*), **An analysis of operational 300 mb transosonde flights from Japan in 1957–1958.** U. S. Weather Bureau, Jan. **1959.** 41 p. 15 figs., 8 tables, 19 refs., 14 eqs. **DWB** (M07.321.2 U587an)—This paper summarizes the operational 300 mb constant level balloon or transosonde flights carried out by the U. S. Navy from Iwakuni, Japan during 1957–1958. "Mean" trajectories are determined and the large scale dispersion is estimated both by direct evaluation of the root mean square distances between mean and individual transosonde positions and by the application of Taylor's equation to the auto-correlation function. Velocities and ageostrophic velocities obtained from the transosonde flights are analyzed statistically with the aid of power spectrum analysis. From comparisons of transosonde and radiosonde data, vertical air motions are estimated and some evidence is

presented for the existence at 300 mb of a northward ageostrophic flow between Japan and the east coast of North America. "Abnormal" flow is discussed briefly and comparisons are made between the vertical oscillations of the transosondes and certain meteorological parameters. *Subject Headings:* **1. Transosonde data 2. Transosonde trajectories 3. Wind velocities 4. Vertical motion 5. North Pacific.**—*Author's abstract.*

10.10–152 551.506.7:551.557(44)

*World Meteorological Organization. Commission for Instruments and Methods of Observation, **Quelques données numériques sur la circulation atmosphérique à haute altitude entre 20 et 30–35 km: résultant de sondages exécutés à Trappes (Seine et Oise), entre le 15 octobre 1956 et le 31 mai 1957** [Some numerical data on the atmospheric circulation at high altitude between 20 and 30–35 km resulting from soundings at Trappes (Seine et Oise), Oct. 15, 1956–May 31, 1957], **Pt. 2, Figures.** Issued **1957.** entirely charts (51, many fold). At head of t-p.: C.I.M.O. Paris 1957. Colloque d'information. Document présenté par G. D. Barbé. **DWB** (M(06) W927 cm CIMO: 1957)—Detailed graphical presentation of high level wind soundings from the surface to 35 km (or less), made by radar during 1956–57. In many instances serial soundings were made at short intervals and in other instances comparative soundings are shown between nearby stations (Bretigny) and Trappes. Both wind direction and wind speed are given. Wind maxima at 8–13 km are pronounced, in many instances. In several instances secondary maxima occur at 25–30 km. which are as strong as or stronger than the low level maxima. *Subject Headings:* **1. High level wind soundings 2. Upper air wind data 3. Trappes, France. I. Barbé, G. D.** (*ed.*).—*M.R.*

INSTRUMENT CARRIERS

See also: **IGY satellite program,** 10.10–1; **Satellite investigation of cosmic space,** 10.10–90; **Vanguard I satellite** (Easton, Votaw), 10.10–92; **Satellite obs.** (Nicolet), 10.10–93; **Sattelite tracking** (Adams et al.), 10.10–95; **Satellite obs. of upper atmos.** (Schmidt), 10.10–96; **Met. satellites** (Wexler), 10.10–97; **Pilot balloon data analysis** (Guterman), 10.10–122; **Satellite radiation measurement** (Van Allen et al.), 10.10–133; **Transosonde data, N. Pacific** (Angell), 10.10–151; **Mast profile instrumentation** (Stewart), 10.10–161; **Satellite obs. of ionosphere** (Al'pert), 10.10–200; **Obs. of atmos. diffusion with balloons** (Wilkins), 10.10–227.

10.10–153 551.507.321.2

Arkhangel'skiĭ, V. N. and Reĭtlinger, S. A., **Avtomaticheskie stratostaty dlia issledovania atmosfery.** [Automatic stratostats for studying the atmosphere.] *Meteorologiia i Gidrologiia,* No. 11:47–50, Nov. **1956.** 3 figs., table, 8 refs. **DWB, DLC**—A review of some of the non-Soviet literature on constant level balloons that has appeared since 1948, in particular in the U. S. This includes their construction, physical properties, instrumentation, etc. *Subject Headings:* **1. Constant level balloons 2. Stratostats.**—*I.L.D.*

10.10–154 551.507.321.2:551.508.822

Devereaux, R. N. (*U. S. Geophysics Res. Directorate, Bedford, Mass.*), **Use of ammonia gas in balloon inflations.** *American Meteorological Society, Bulletin,* 37(9):472, Nov. **1956. DWB.** Review by R. Bilancini in *Rivista di Meteorologia Aeronautica,* Rome, 17(2):66, April/June **1957.**—During October and November 1955, 10 radiosonde flights were made with balloons filled with ammonia. Six daytime flights reached 66,000 ft (average) and 2 reached 73,000 ft. Four night flights were made: 2 daytime balloons averaged 36,000 ft and 2 nighttime balloons averaged 60,000 ft. Ordinary commercial 100-pound cylinders of liquid ammonia, costing about $7–$8 (or $1 per balloon), were used. The balloons filled as rapidly as with hydrogen gas. Safety precautions are necessary to reduce hazards to a minimum. Hot water surrounding coils of steel tubing are used to vaporize the liquid ammonia. *Subject Headings:* **1. Balloon inflation with ammonia 2. Radiosonde balloon inflation.**—*M.R.*

10.10–155 551.507.321.4

Daniels, Glenn E. (*Met. Dept., Fort Huachuca, Ariz.*), **Safety deflation device for large captive balloons.** *American Meteorological Society, Bulletin,* 40(2):53–55, Feb. 1959. 4 figs. **DWB, DLC**—The mechanism for the automatic deflation of captive balloons in the event of mooring cable breakage has reduced a hazard to air navigation. Devised at the U. S. Army Electronic Proving Ground (USAEPG) at Fort Huachuca, Ariz., this mechanism has also effected savings in recovered balloons and meteorological instruments. *Subject Heading:* **1. Captive balloon deflation.**—*Author's abstract.*

10.10–156 551.507.362.1:551.501.7

Izakov, M. N. and Kobin, G. A., **Izmerenie temperatury, davleniia i plotnosti atmosfery s pomoshch'iu raket.** [Rocket measurements of atmospheric temperature, pressure and density.] *U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby. Komitet po Provedeniiu Mezhdunarodnogo Geofizicheskogo Goda, Informatsionnyĭ Sbornik,* No. 4:57–61, 1957. 3 figs. **DWB**—The Central Aerological Observatory developed a special meteorological rocket whose head is released at a given altitude and comes down by parachute so that the instruments remain for a longer time in the strata being investigated. The rocket head contains thermal manometers measuring pressure within a range of 10 to 5×10^{-3} mm Hg; membrane manometers measuring pressure from 760 mm to 10 mm Hg, special resistance thermometers and bolometers. The recordings of the instruments are transmitted by radio. The head also contains a camera and the photographs obtained are used to determine the position of the rocket in flight. Various theoretical and experimental problems associated with the measurement of temperature, pressure and density were solved. These include the phenomena resulting from the movement of the instruments in rarefied gas, the inertia of the recording devices, the relationship of the thermal coefficient of restoration of the thermometers and manometers and the Mach and Reynolds numbers, the relationship of the manometer pressure and the Mach number, etc. The pressure and temperature are two interdependent variables since pressure can be computed from temperature obtained by the given thermometers by means of the barometric formula and the equation of state, and temperature can be computed similarly from pressure measured with a manometer. Graphs giving the distribution of temperature with height, pressure with height, and density with height, according to data of the Central Aerological Observatory and U. S. data, are presented. *Subject Heading:* **1. Rocket observation techniques.**—*I.L.D.*

10.10–157 551.507.362.2:551.510.3:551.510.53

Sterne, Theodore E. (*Smithsonian Astrophysical and Harvard College Obs.*), **An atmospheric model, and some remarks on the inference of density from the orbit of a close earth satellite.** *Astronomical Journal,* New Haven, Conn., 63(3):81–87, March **1958.** 4 tables, 4 refs., 17 eqs. **DLC**—The U. S. Air Force has extended the U. S. Standard Atmosphere to over 540,000 m of altitude. The author has extended the Air Force model to still greater heights, and suggests the employment of the resulting model for inferring the air density from observations of the orbit of a close earth satellite. Convenient equations, involving easy numerical quadrature in the eccentric anomaly, are derived accurately and fundamentally for the time-derivatives of the perigee and apogee distances of a close earth satellite moving through an atmosphere. If the extended Air Force atmospheric model is nearly correct, then a 50-centimeter, 10-kilogram, spherical earth satellite with a perigee height of about 200 mi and an apogee height of about 800 mi should be expected to have a life-time of about nine years. Calculations of only slide-rule accuracy enable rather accurate adjustments to be made to the density near perigee from observations of the changing apogee distance. The density may not be determined from astronomical observations with much relative accuracy at heights much above the initial perigee. It is suggested that definitive adjustment of the atmospheric density be made by a least-squares solution in which the unknowns are the vertical gradients of the ratio of temperature to molecular weight in selected altitude zones. Equations are given for the differential changes in air density caused by differential changes in such gradients. *Subject Headings:* **1. Standard atmosphere 2. Satellite density observations 3. Upper atmosphere density.**—*Author's abstract.*

INSTRUMENTS

See also: **Radiosonde code manuals,** 10.10–41; **Water temp. instruments** (Kontoboitseva), 10.10–72; **Rawin data analysis** (Guterman), 10.10–122; **Radiosonde data processing** (Mani, Venkataraman), 10.10–131; **Airplane soundings** (Veĭdner), 10.10–132; **Radiosonde balloon inflation** (Devereaux), 10.10–154; **Radiosonde temp. measurement** (Kastrov), 10.10–264; **Electrophotometer for auroral and night sky brightness measurement** (Dzhordzhio), 10.10–308.

10.10–158 551.508.21:53.089.6

Wörner, H., **Die rechnerische Ausgleichung von Eichmessungen bei Geräten mit nicht linearer Eichkurve, dargestellt am Beispiel des Kugelpyranometers.** [Mathematical smoothing of calibration measurements of instruments not having a linear calibration curve, exemplified by spherical pyranometers.] *Zeitschrift für Meteorologie*, Berlin, 11(8):225–233, Aug. **1957.** 2 figs., 2 tables, 3 refs., 15 eqs. **DWB, DLC**—The mathematical determination of the reliability of a calibration curve in the case of instruments in which the calibration value is a function of an independent variable is attained by a mathematical derivation of the most probable calibration curve. The determination of a calibration curve for the simplest case for $f(x)$, that is the linear equation $y=a+bx$, is outlined. The determination of curves of the second order by means of least squares is illustrated and the analytical interpretation of a formal equation of the second degree which is the curve of a conical section (parabola, ellipse, circle, hyperbola) is presented. The analytical derivation of a calibration curve for a spherical pyranometer is presented and parabolic curves, with an axis coinciding with the calibration value and with a horizontal axis and a hyperbola with equal axis, are developed. Of all the curves, the equal armed hyperbola shows the best correspondence with empirical values. *Subject Headings:* **1. Pyranometer calibration 2. Instrument calibration.**—*I.L.D.*

10.10–159 551.508.25:551.521.17

Grasnick, Karl-Heinz, **Ein neues Messgerät zur Registrierung der Globalstrahlung im UV-A- und UV-B-Spektralbereich.** [A new device for recording global radiation in the A and B spectral regions of the UV.] *Zeitschrift für Meteorologie*, Berlin, 12(1/2):26–31, Jan./Feb. **1958.** 8 figs., 3 refs. **DWB, DLC**—A new instrument for measuring simultaneously UV-B (280–320 nm) and UV-A (320–400 nm) is described with the aid of photographs. The apparatus consists of a double walled box made out of "Pertinax" and the measuring elements are attached to the cover. Constant temperature CdS crystal photoelectric resistances kept in a thermostat are the measuring elements. A contact thermometer controls, across a relay, a carbon filament lamp, which provides the heat. Both spectral regions are received through glass and liquid filters. By inserting small Larché spheres, which are separated by quartz lids the Lambert cosine law is fulfilled adequately. Any six-color recorder of suitable sensitivity can be used. *Subject Heading:* **1. Ultraviolet radiation instruments.**—*I.L.D.*

10.10–160 551.501.724:551.508.26:551.524.4

*Lettau, Heinz H. (*Geophysics Research Directorate*), **Temperature profile instrumentation.** (In: Lettau, H. H. and Davidson, Ben. (*eds.*), **Exploring the atmosphere's first mile.** N. Y., Pergamon Press, **1957.** Vol. 1:152–156. 3 tables.) **DWB**—The author describes briefly the instrument types used in the measurement of profiles of mean air temperature during the Great Plains Turbulence Field Program (shielded aspiration thermocouples, shielded nonaspirated thermocouples and shielded nonaspirated thermometers), as well as the observation procedures and recording equipment. The temperatures measured by the various instruments are compared on the basis of a harmonic analysis of the observed diurnal temperature variations. It is concluded that "in spite of differences in equipment and sampling methods the relative error of mean temperature profile measurements for the MIT, Johns Hopkins, and Univ. of Texas systems is about the same and equal to approximately ±0.05°C." Tables giving the results of Fourier analysis of temperature variations are presented. *Subject Headings:* **1. Temperature profile instrumentation 2. Instrument comparisons 3. Great Plains Turbulence Field Program.**—*I.L.D.*

10.10–161 551.507.724:551.511.6:551.524.3 551.508.26

Stewart, R. M., Jr. (*Iowa State College*), **Mast profile instrumentation for statistics of temperature fluctuations.** (In: Lettau, H. H. and Davidson, Ben. (*eds.*), **Exploring the atmosphere's first mile.** N. Y., Pergamon Press, **1957.** Vol. 1:199–205. 12 refs.) **DWB**—The theory underlying the measurement of the spatial distribution of the free air temperature. This involves consideration of several statistical measures such as the standard deviation and, in particular, the autocorrelation coefficient R_1 defined as

$$R_0 = \left[\int_{t-t^*}^{T} f(t)\cdot f(t-t^*)dt\right] \Big/ \int_0^T f^2(t)dt.$$

Considers the time scale distortion or lag time of the system as a result of which error is introduced. Also the properties of the transducer's sensor are discussed. A review of previous studies (since 1932) in the field of turbulent temperature fluctuations is presented and the experimental techniques employed by the various groups at O'Neill to measure thermal turbulence are outlined in detail. *Subject Headings:* **1. Thermal turbulence measurement 2. Mast instrumentation 3. Micrometeorological profile measurements 4. O'Neill, Nebr.** —*I.L.D.*

10.10–162 551.508.29:631.43:536.24

Portman, Donald J. (*Univ. of Mich., Ann Arbor*), **Gier and Dunkle heat flow meters and heat storage variations—Johns Hopkins University.** (In: Lettau, H. H. and Davidson, Ben. (*eds.*), **Exploring the atmosphere's first mile.** N. Y., Pergamon Press, **1957.** Vol. 1:64–66. table, 2 eqs.) **DWB**—The use of the Gier and Dunkle heat flow meter to measure soil heat flux transfer in one dimension is described. The data on heat flux at a depth of 2.5 cm as attained by the heat flow meter and as computed with the equation

$$S_0 = \int_0^D (\rho c \Delta T/\Delta T)dz$$

are compared in a table. The hourly values of soil heat transfer ($\Delta t = 0$) are computed by plotting observed values of the integrand against z, arbitrarily connecting the points with a smooth line and measuring the area outlined by the curve, the two axes and the line $z = D$ which is the depth at which $T = 0$. The data are in relatively good agreement but show significant differences in certain hours as might be expected because of the deficiencies in the comparison method. *Subject Headings:* **1. Gier and Dunkle heat flow meters 2. Soil heat transfer.**—*I.L.D.*

10.10–163 551.508.29:536.53

Portman, Donald J. (*Univ. of Mich., Ann Arbor*), **Shielded thermocouples—Johns Hopkins University.** (In: Lettau, H. H. and Davidson, Ben. (*eds.*), **Exploring the atmosphere's first mile.** N. Y., Pergamon Press, **1957.** Vol. 1:157–167. 2 figs., 3 refs.) **DWB**—The author describes in detail the temperature measurement system developed at the Johns Hopkins University Laboratory of Climatology to measure temperature profiles at heights of 10 to 640 cm above the ground surface. The contents include the following: a description of the thermojunction radiation shields and lead wires, the constantan junction zone box, the common reference junction, switches, amplification systems, meter; meter and reference temperature compensator, calibration of thermocouple wire; observational procedure; and accuracy, including instrumental errors, radiation errors and sampling errors. *Subject Heading:* **1. Shielded thermocouples.**—*I.L.D.*

10.10–164 551.508.29:536.53

Rhoades, D. G. (*Geophysics Research Directorate*), **Aspirated thermocouples—University of California.** (In: Lettau, H. H. and Davidson, Ben. (*eds.*), **Exploring the atmosphere's first mile.** N. Y., Pergamon Press, **1957.** Vol. 1:168–170. fig.) **DWB**—A description of the construction of the aspirated copper constantan thermocouples. The sensors and calibration equipment, the suction of the air flow and the circuit arrangement of the electrical typewriter used to record the observations are described and the sampling intervals, data presentation and error estimates are discussed. *Subject Heading:* **1. Aspiration thermocouples.** —*I.L.D.*

10.10–165 551.508.29

Knowles, D. G. (*Geophysics Research Directorate*), **Gier and Dunkle heat flow meters—University of California.** (In: Lettau, H. H. and Davidson, Ben. (*eds.*), **Exploring the atmosphere's first mile.** N. Y., Pergamon Press, 1957. Vol. 1:67–68.) DWB—To measure the rate of heat flowing into and out of the soil, the Univ. of California group at O'Neill used flat-plate heat flow meters as transducers. These plates are fabricated by GIER and DUNKLE. The flat-plate heat flow meter is a thermopile instrument employing some 700 silver-constantan thermocouples. The installation of the flat-plate heat flow meters under the soil cover conditions at O'Neill is discussed. *Subject Headings:* **1. Gier and Dunkle heat flow meters 2. O'Neill, Nebr.**—*I.L.D.*

10.10–166 551.508.53/4

Knowles, D. G. (*Geophysics Research Directorate*) and Vehrencamp, J. E. (*North American Instruments, Inc., Altadena, Calif.*). **Sheppard type anemometers—University of California.** (In: Lettau, H. H. and Davidson, Ben. (*eds.*), **Exploring the atmosphere's first mile.** N. Y., Pergamon Press, 1957. Vol. 1:136–139. 2 figs., table.) DWB—The authors describe the modified Sheppard type anemometer which included a photocell circuit "such that each revolution of the cup shaft would make and break a contact, the counting being done with the Veeder-Root electromechanical counters." The anemometer calibration, wind profile measurements at O'Neill and the data presented in Vol. 2 are discussed. *Subject Headings:* **1. Recording anemometers 2. Cup anemometers 3. O'Neill, Nebr.**—*I.L.D.*

10.10–167 551.508.54

Anderson, L. J. (*Smyth Res. Associates, San Diego*). **Hot-wire anemometer for laboratory and field use.** *American Meteorological Society, Bulletin*, 14(2):49–52, Feb. 1959. 6 figs. DWB, DLC—A simple instrument is described for measuring or recording wind speed, using a 1-in. length of heated platinum wire as the sensing element. As a practical laboratory and field device, its main virtues are its excellent response at low speeds and its utility in confined spaces. Calibration techniques are described, and the circuit diagram is included for a three-range instrument. *Subject Heading:* **1. Hot wire anemometers.**—*Author's abstract.*

10.10–168 551.508.54

Kassander, A. R. (*Inst. of Atmos. Physics, Univ. of Arizona, Tucson*) and Stewart, R. M., Jr., **Ping-pong ball anemometers—Iowa State College.** (In: Lettau, H. H. and Davidson, Ben. (*eds.*), **Exploring the atmosphere's first mile.** N. Y., Pergamon Press, 1957. Vol. 1:140–144. fig., ref.) DWB—In order to obtain the small size, light weight and physical strength of a low inertia anemometer, the authors constructed anemometer cups out of halves of "ping-pong" balls. The preparation of the "ping-pong" balls for their use as anemometer cups, the electrical instrumentation (including the design of the pre-amplifier, the recorder unit, the registration circuits), the calibration and the performance of the anemometers are discussed. *Subject Headings:* **1. Cup anemometers 2. "Ping-pong" ball anemometers.**—*I.L.D.*

10.10–169 551.508.79 551.501.81:551.577.7

Lhermitte, Roger. **La représentation directe du spectre de fluctuation des échos radar donnés par des précipitations.** [Direct representation of the fluctuation spectrum of radar echoes from precipitation.] *Académie des Sciences, Paris. Comptes Rendus*, 248 10):1554–1556, March 9, 1959. fig., table, ref. **DWB, DLC**—The fluctuations observed in the intensity of echoes obtained on wide-spread atmospheric precipitation by means of a fixed vertical beam radar, are directly dependent on the nature of the detected precipitation. The author has developed an automatic frequency analyzer which gives directly the spectrum of the fluctuation frequencies of precipitation echoes. Description and functioning of this device are given. Two characteristic examples—one relating to snow and the other to rain, and illustrating the results obtained with this apparatus—are presented. The spectrum of the echo on snow does not reach above 130 p/s, corresponding to a maximum difference in the fall-velocity of the

particles equal to 2 m/s. On the other hand, the spectrum of the echo on rain reaches frequencies of 400 p/s, corresponding to differences in speed of the particles equal to 6 m/s. (*See also* 10.1–160, Jan. 1959, *MAB.*) *Subject Headings:* **1. Radar precipitation echoes 2. Frequency analyzer 3. Precipitation echo spectra 4. Magny-les-Hameaux, France.**—*A.V.*

10.10–170 551.508.824

Kamamoto, H.; Yakame, K.; Mori, F.; Oka, M. and Inagaki, H. (*all, Weather Instrument Plant, J. M. A., Fukawa*), **The improved automatic climatological station for the Antarctica.** *Geophysical Magazine*, Tokyo, 28(4):583–591, Sept. **1958.** 9 figs., 2 tables, ref. **DWB, DLC**—In this paper the design of the improved automatic climatological station for Antarctica is reported on. The present equipment records barometric pressure, wind direction, wind speed, sunshine intensity and air temperature for more than four hundred days. According to the experiences of the Preparatory Observation Corps to the Antarctic, the new equipment has been improved remarkably. The main improvements are as follows: 1) a sensing element is incorporated, 2) the tower has been lowered and its weight lessened, 3) an electric clock is used to move the chart paper, and 4) an Eppley pyrheliometer and millivoltmeter are used to record sunshine intensity. *Subject Headings:* **1. Automatic weather stations 2. Automatic recorders 3. Antarctica.**—*Authors' abstract.*

10.10–171 551.508.952

Rasool, Ishtiaq and Vassy, Arlette, **Répartition verticale de l'ozone atmosphérique.** [Vertical distribution of atmospheric ozone.] *Académie des Sciences, Paris, Comptes Rendus*, 248(7):999–1001, Feb. 16, **1959.** fig., 3 refs. **DWB, DLC**—The authors have built a special radiosonde for measuring the vertical distribution of atmospheric ozone and made out a series of abaci for the analysis which make it possible to calculate from the raw data on the recorder record the depth of ozone situated above the sounding balloon. Starting from this, and being aware of the zenith distance, one can determine the ozone content of air for every altitude beneath the level reached by the balloon. Comparisons were made at Uccle (Belgium) between this type of radiosonde and the radiosonde of H. K. PAETZOLD intended for the same purpose. Examples of vertical distribution of ozone in the atmosphere measured by this radiosonde are given. *Subject Headings:* **1. Vertical distribution of ozone 2. Ozonesondes 3. Uccle, Belgium.**—*A.V.*

SYNOPTIC ANALYSIS AND FORECASTING

See also: **Arctic synoptic analysis** (Reed), 10.10–24; **Radiosonde code manuals,** 10.10–41; **Ocean wave forecasting** (Marks, Chase), 10.10–79; **Airport landing forecasts** (Atkins), 10.10–99; **Forest fire forecasting** (Filimonov, Nikol'skii), 10.10–112; **Runoff forecasting** (Popov), 10.10–125; **Radioactive fallout forecasting** (Spohn), 10.10–220; **Long range temp. forecasting** (Křivský), 10.10–294.

10.10–172 551.509.312:551.511 551.509.317:551.547

Huber-Pock, Franz (*Vienna*), **Vergleichende Untersuchungen zur graphischen Integration der barotropen Wirbelgleichung.** [Comparative study of the graphical integration of the barotropic vorticity equation.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, Vienna, 11(1):29–37, **1959.** 5 figs., 2 tables, 5 refs., 5 eqs. German, English and French summaries p. 29–30. Also his: **Ein statistisches Verfahren zur Verbesserung und Beschleunigung der graphischen Integration der barotropen Wirbelgleichung.** [Statistical method for improvement and acceleration of graphical integration of barotropic vorticity equations.] *Ibid.* p. 38–47. 3 figs., 4 refs., 6 eqs. German, English and French summaries p. 38–39. **DWB, DLC**—In the first article it is shown by a given weather situation that the quality of a 24-hour forecast of the velocity field of the 500 mb surface on the basis of graphic integration of the barotropic vorticity equation depends in the first place on the lattice distance by which the three-dimensional mean value of the geopotential is determined. The optimum value for the precalculation of the vorticity field is a lattice distance of 1000 km. An

average field determined with this distance shows maximal constancy in time. The success of calculating the variation of the vorticity field (graphical solution of the Poisson equation) by means of the approximative method of Fjørtoft is dependent to a great extent on the lattice distance, too, in this case, the most suitable lattice appears to be about 600 km. In the second article he discusses the graphic integration of the barotropic vorticity equation which is usually carried out in two steps: First, displacement of the lines of equal magnitude of vorticity on the basis of the space-averaged, and therefore very conservative, geostrophic current field. Secondly, redetermination of the high altitude pressure field from the variation field of the vorticity values by means of an approximation method of Fjørtoft. The latter method can be avoided by using a statistical procedure which accelerates considerably the whole integration. Furthermore, it can be shown that the procedure is placed on a more general basis as the Fjørtoft approximation (by which the Poisson equation is solved) requires special restrictive conditions to assure convergence. A concrete example treated by this method shows that the vorticity distribution determined by combination of statistics and dynamics is somewhat superior to that obtained from the sole steering effect. Therefore, the integration can be extended successfully to a 48 hour period. At the same time, by avoiding averaging over space as applied in the former procedure, a considerable acceleration of the method is made possible, particularly as calculations can be carried out from point to point and with the aid of calculation machines. *Subject Headings:* **1. Barotropic vorticity equations 2. Graphical integration 3. Fjørtoft's graphical method.**—*Author's abstracts.*

10.10–173 551.509.312:551.547:551.515.22

Jordan, C. L. (*Florida State Univ.*), **Estimation of surface central pressures in tropical cyclones from aircraft observations.** *American Meteorological Society, Bulletin*, 39(7):345–352, July **1958.** 6 figs., table, 10 refs., 8 eqs. **DWB, DLC**—Dropsonde data from the eyes of tropical cyclones are used for testing old and deriving new empirical relationships between the surface pressure and the heights of constant-pressure surfaces. The derived regressions are used for the preparation of a nomogram which can be used for estimating surface pressure in the eye of a tropical cyclone from aircraft pressure-height data at any level between the surface and 500 mb. The regressions also provide a basis for some comments on the mean thermal structure of the eye. *Subject Headings:* **1. Surface pressure—constant pressure height relationships 2. Eye of tropical cyclone pressures 3. Airplane observations.**—*Author's abstract.*

10.10–174 551.509.312:551.511

Kusano, K., **On the inspection of graphical barotropic prediction and its correction by means of CAV trajectory.** *Journal of Meteorological Research*, Tokyo, 10(5):376–382, May **1958.** 6 figs., 5 tables, 4 refs., 6 eqs. In Japanese; English summary p. 376. **DWB.** Also issued as: *Sendai, Japan. Central Meteorological Observatory, Journal of Meteorological Research of Tohoku District*, Vol. 12, Memoir No. 3, March **1959.** 7 p. 6 figs., 5 tables, 4 refs. Reprint from unidentified source. In Japanese; English summary [p. 8]. **DWB**—The method of graphical integration based on the barotropic model has been introduced in routine work at Sendai DMO since Sept. 1955. In this paper, comparisons between calculated value of vorticity advection and observed 24 hour-500 mb height change in Sept. and Oct. 1957 are presented. There are 17 cases which are unsatisfactory with correlation coefficient less than 0.60. Most of them are due to cold vortex, cold trough, cut off low, typhoon, etc., because of over-drifting by $\bar{Z}$ fields. CAV Trajectory analysis is successfully applied to correct the over-drifting of these upper disturbances, though some cases were unsatisfactory because CAV Trajectory could not be drawn. *Subject Headings:* **1. Graphical prediction models 2. Barotropic models 3. Forecasting techniques.**—*Author's abstract.*

10.10–175 551.509.313:551.543

Brandejs, S. and Zikmunda, O., **Rovnice pro předpověď přízemního tlakového pole.** [Equations for predicting the surface pressure field.] *Meteorologické Zprávy*, 10(3):60–63, **1957.** 2 refs., 36 eqs. Czech, Russian and German summaries p. 60. **DWB.** Transl. into English available for reference. **DWB** (M4 B817eq)—For a baroclinic atmosphere with

constant thermal wind direction, a system of prognostic equations is derived, which is suitable for numerical forecasting of the surface pressure field and for the 1000–500 mb relative topography. Both geostrophic approximation and HINKELMANN's extension are used in the equations, and fixed as well as variable level of nondivergence is accounted for. *Subject Headings:* **1. Surface pressure field 2. Numerical pressure forecasting.**—*Authors' abstract.*

10.10–176 551.509.313

Koo, Chen-chao (*Inst. of Geophysics and Met., Academia Sinica*), **On the utilization of past data in numerical weather forecasting.** *Acta Meteorologica Sinica, Peking*, 29(3):176–184, Aug. **1958.** 7 refs., 9 eqs. In Chinese; English summary p. 184. **DLC**—Until now, past data were not utilized in numerical weather forecasting owing to the particular statements of the problem. It is pointed out in this paper that the condition for solution, formed by whole set of available meteorological data, is not compatible to the general system of weather equations. Thus it is necessary to study the best way of formulation of the problem using the available meteorological data as much as possible in the condition for solution, in order to obtain the optimum way of forecasting. Two possibilities are given. First, it is shown that under certain conditions, weather forecasting may be formulated as an evolution problem, in which the past data are utilized. Second, past data could also be partly utilized in an initial value problem in which the system of weather equations, with certain meteorological variables eliminated, contain higher order time derivatives. The significance of these formulations is discussed. *Subject Headings:* **1. Numerical forecasting techniques 2. Numerical forecasting from past data.**—*Author's abstract.*

10.10–177 551.509.318:551.575.1(439.1)

Antal, Emánuel, **A köd gyakorisága és tartama különböző makroszinoptikus helyzetekben.** [Frequency and duration of fog during various large-scale synoptic situations.] *Időjárás*, Budapest, 62(1):39–45, Jan./Feb. **1958.** 4 tables, 3 refs. Hungarian and Russian summaries p. 39. **DLC**—Fog conditions at 11 stations in Hungary (mostly airports) are analyzed according to large-scale synoptic situations. Data on monthly frequencies of foggy days, probabilities of fog formation during different weather situations, and duration frequencies are presented. *Subject Headings:* **1. Fog duration 2. Fog frequencies 3. Synoptic conditions for fog 4. Hungary.**—*Transl. of author's abstract.*

10.10–178 551.509.318:551.524.37(47)

Persova, E. G., **Usloviia obrazovaniia izmorozi v Tatarskoĭ ASSR.** [Conditions for the formation of rime in the Tatar ASSR.] *Meteorologiia i Gidrologiia*, No. 11:32–34, Nov. **1956. DWB, DLC**—The meteorological and synoptic conditions associated with rime occurrence in the Tatar A.S.S.R. are analyzed on the basis of material collected by 14 meteorological stations from January 1949 to January 1955. The spatial and temporal distribution of rime is reviewed briefly. Calm or very low wind velocity prevails during rime occurrences and more than half are associated with southerly winds. Two groups of synoptic processes favor rime occurrence. In the first, they are associated with advection of heat proceeding at the periphery of cyclones or in their central parts, since anticyclones move from the north or from the northeast. In the second group, they occur through the gradual cooling both at the earth's surface and in the lower troposphere during the passage of ridges of the Kazakh anticyclone, in stationary anticyclones or posterior ridges forming over European U.S.S.R. and in the filling up of anticyclones aloft or in trough. *Subject Headings:* **1. Synoptic conditions for rime 2. Rime formation 3. Tatar A.S.S.R.**—*I.L.D.*

10.10–179 551.509.318:551.515.4

Ponomarenko, S. I., **Sinoptiko-aerologicheskie usloviia vozniknoveniia groz na teplom fronte.** [Synoptic-aerological conditions for the formation of warm front thunderstorms.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, No. 60:96–107, **1957.** 8 figs., 3 tables, 7 refs., eqs. **DWB** (M(055) U581tts)—The results of investigations of the synoptic-aerological conditions associated with the origin of thunderstorms on the basis of 850, 700 and 500 mb

synoptic charts and 300/1000 mb thickness charts plus aerological data for the periods of April–Sept. 1950–1954 in the region bounded by 25° and 50° east longitude and 50°–49° north latitude. Synoptic analysis showed that in the European U.S.S.R. 43% of all fronts are accompanied by thunderstorms and generally such fronts are warm fronts (73.1% of warm fronts in June, 68.0% in July and 10.0% in April). In deepened cyclones and troughs, fronts with thunderstorms constitute 55.5%; in filled cyclones and troughs, 23.5% and in high pressure ridges, 13.3–9.1%. Thunderstorms are observed most often with warm fronts moving from the south. With increased absolute values of temperature and humidity, the probability of thunderstorms increases. The aerological analyses, involving calculation of energy of instability for a given layer and moisture content, indicate that the thermodynamic and hygrometric properties of air masses circulating in warm frontal zones with thunderstorms differ from those of air masses in frontal zones without thunderstorms. For the origin of thunderstorms on a warm front not only positive energy of instability and adequate moisture are necessary, but also a decrease in the horizontal contrasts of temperature and height. A procedure for forecasting thunderstorms in a warm front is outlined. *Subject Headings:* **1. Synoptic conditions for thunderstorms 2. Synoptic aerological studies 3. Warm fronts 4. U.S.S.R.**—*I.L.D.*

10.10–180 551.509.323:551.524.36:656.71(431.5)

Lamp, Werner, **Angenäherte Bestimmung des Temperatur-Minimums (Grad Fahrenheit) bei Ausstrahlungsnächten auf dem Flughafen Rhein-Main.** [Approximate determination of the temperature minimum (in °F) on radiation nights at the Rhein-Main airport.] *Meteorologische Rundschau*, Berlin, 10(5):170–172, Sept./Oct. **1957.** fig., table, 5 refs. **DWB, DLC**—A method was developed for making approximate minimum temperature forecasts at 1430 G.M.T. of the preceding day, provided either clear or almost clear nights (cloud cover less than $\frac{3}{8}$ and high clouds) are expected. 113 nights for 1955 and 1956 were evaluated. Also no change in air mass is presupposed. An analysis of the dew point relative humidity at 1430 G.M.T. of the preceding day and corresponding temperature and mean wind conditions are presented in a table. Since in almost all instances the northeast wind direction predominates it is evident that the night minimum depends upon the following: the relative humidity at 1430 GMT of the preceding day, mean wind intensity at night and the dew point at 1430 GMT of the preceding day. The greater the relative humidity the greater is the dew point-temperature difference, i.e. the farther is the minimum from the dew point in the direction of lower temperature. If the relative humidity is less than 45% the 1430 GMT dew point is usually never reached by the temperature minimum. With decreasing wind velocity the minimum moves farther away from the dew point towards the lower temperature. The fog formation on outgoing radiation nights is discussed. *Subject Headings:* **1. Nocturnal minimum temperature forecasting 2. Minimum temperature forecasting techniques 3. Radiation fog 4. Airport temperatures 5. Rhein/Main Airport, Germany.**—*I.L.D.*

10.10–181 551.509.323.2:551.524.37(476)

Medzhitov, R. M., **Analiz mestnykh uslovii obrazovaniia i prognoz zamorozkov v Belorussii.** [The analysis of local factors and the forecast of the early frosts in Byelorussia.] *Lietuvos TSR Mokslų Akademija. Geologijos ir Geografijos Institutas, Moksliniai Pranesimai*, 5:159–173, **1957.** 7 figs., 5 tables, 5 refs. **DWB**—The author analyzes the occurrence of early frosts in Byelorussia with regard to the soil-topographical conditions and air circulation. Some recommendations for the forecast of early frosts under the conditions of Byelorussia are proposed. *Subject Headings:* **1. Early frosts 2. Frost forecasting 3. Byelorussian S.S.R.**—*Author's abstract.*

10.10–182 551.509.332:551.547

Belov, P. N., **Prognoz atmosfernogo davleniia s pomoshch'iu empiricheskikh funktsii vliianiia.** [Forecasting atmospheric pressure with the help of empirical influence functions.] *Meteorologiia i Gidrologiia*, Leningrad, No. 2:10–16, **1958.** 3 figs., 3 tables, 11 refs., 2 eqs. **DWB, DLC.** Transl. by Valys Zilius issued by American Meteorological Society under contract AF 19(604)-1936, July 1958. (11 p.)—The author presents a method of forecasting

pressure fields at different atmospheric levels 24 and 36 hrs in advance by means of empirical influence functions. According to this method it is assumed that in a limited area between circulation conditions (distribution and transfer of vortices and temperature) there exists at a given moment a determinable relationship with subsequent pressure change. The relationship is expressed in the formula

$$\delta P_{i=1} = A_{00} + \sum_{j=0}^{m} \sum_{i=1}^{n} A_{ij} H_{ij} + \sum_{j=1}^{m} B_j (H_j, H_{j-1})_{i=1},$$

where $\delta P_{i=1}$ = pressure change at sea level at point $i=1$ during subsequent 24–36 hours, H_{ij} = geopotential of different isobaric surfaces ($j=0, 1, \ldots, m$) at different geographic points ($i=1, 2, \ldots, n$) at the initial moment; Jacobians (H_j, $H_{j=1}$) characterize transfer of temperature in the layer situated between isobaric surfaces j and $j-1$ for points $i=1$; A_{ij} and B_j = empirically determined coefficients which are the empirical influence functions. The determination of the latter by the method of least squares is described. The use of empirical influence functions is illustrated by their applications to forecasting pressure changes at sea level and of heights of isobaric surfaces during the winter season (December, January and February) for 20 points in the European part of the U.S.S.R. The computation of empirical influence which required the solution of six different systems of equations with 45 unknowns was effected by means of an electronic computer. The pressure estimates for Moscow for 175 days of three winter seasons (1953–1956) and for 20 days from Dec. 1, 1956 to Feb. 28, 1957, data on the transport of temperature at individual atmospheric layers involved as pressure changes and weather charts for specific days and of predicted pressure change are presented. *Subject Headings:* **1. Pressure forecasting 2. Empirical influence functions 3. Numerical forecasting 4. Moscow, U.S.S.R.**—*I.L.D.*

WEATHER CONTROL

See also: **Cloud modification, 10.10–62.**

10.10–183 551.509.616:551.576.11:551.558.1

Dessens, Henri (*Puy de Dôme Obs.*), **Essai de formation artificielle de cumulus par utilisation exclusive de l'énergie solaire.** [Attempt to produce cumulus clouds artificially, using only solar energy.] *Puy de Dôme. Observatoire, Bulletin*, Ser. 2, No. 4:113–125, Oct./Dec. **1956.** 6 figs., 4 tables, 10 refs. French and English summaries p. 113. **DWB**—An experimental project conducted in the Lukolela region (1°S, 17°E) of the Belgian Congo has as its object the production of artificial cumulus by superheating of a clearing (in the tropical forest) with surface blackened by burning the grass and shrubs. In the center of a clearing of 25 ha (not large enough to produce convective clouds successfully) there was a laboratory for measuring radiation, temperature, humidity, wind and clouds. Brush fires in the center of other clearings did produce cumulus clouds which were studied and photographed along with those which seemed to form over the clearings in the early morning but were undistinguishable from those forming over the forests during the day. Factors which might have resulted in the "feeble super heating" of the burned clearings were: 1) radiation reduction by daytime cloudiness; 2) soil moisture which is excessive in the clearings; 3) surface winds which reduce temperature gradients as soon as formed (data given for 0830, 1930, 1430 and 1600 h for 0 m to 2,000 m above ground). Winds die out aloft and toward evening, but are quite fresh at the time of greatest heating (in morning). The coupling of the "clearing effect" of the superheated surface, with the "cumulus effect" involving entrainment, release of energy and convective action, is shown schematically by a series of diagrams in some respects similar to the Ludlam and Scorer (1953) theory of convective bubbles. *Subject Headings:* **1. Artificial cumulus formation 2. Burned clearing effects 3. Convective coupling theory 4. Bubble theory 5. Lukolela, Belgian Congo.**—*M.R.*

10.10–184 551.509.616

Hall, W. Ferguson (*U. S. W. B.*), **The Weather Bureau ACN project.** *Meteorological Monographs*, Boston, 2(11):24–46, July **1957.** 13 figs., 4 tables, 4 refs. **DWB, DLC**—The

Weather Bureau has completed a field program in western Washington to investigate the applicability of cloud seeding techniques in migratory cloud systems associated with middle latitude cyclonic activity. The project was designed to give statistically valid estimates of the effects of seeding with dry ice from aircraft, as well as affording surveys of cloud structure with particular reference to natural precipitation mechanisms and seeding potentialities. A number of statistical evaluations have been carried out and, considered as a whole, do not show significant results from the seeding. However, because of the margin of uncertainty present, none of the evaluations excluded the possibility of limited effects. The cloud surveys suggested that favorable seeding opportunities were somewhat infrequent due to the abundance of natural ice crystals in the deeper cloud layers. (For abstract on paper with same title, *see* 6J–309, Oct. 1955, *MAB*.) *Subject Headings:* **1. U. S. W. B. ACN project 2. Cloud seeding from airplane 3. Cloud seeding effectiveness 4. Western Washington.**—*Author's abstract.*

10.10–185 551.509.617:551.578.7

Ruby, Frederick-Leon, **Improved rocket or bomb for the prevention of hail.** (Photostat of trans. into English of original French.) France. Patent Office, Patent No. 1,010,878, Supplement (UNCL Patent No. 61,460). Main patent dated Feb. 6, 1950; applied for March 6, 1951, 15 h. at Lyon; recorded Nov. 17, 1954; published May 4, **1955.** 3 p. **DWB** (M78.7 R8979im)—A patent is described which adds to the nucleating power of silver iodide by the force of the explosion which congeals a large portion of the supercooled droplets in the cloud, thus making them unavailable for growth into hail. Also the patent involves an improvement in the ordinary "rain-producing" aspects of the rockets or bombs, by incorporating a radioactive product in the smoke powder, shell, etc., making the air around ionized and a better conductor and suppressing the electric charges which tend to repel the droplets from one another. *Subject Headings:* **1. Hail rockets 2. Artificial precipitation patents 3. Silver iodide bombs.**—*M.R.*

10.10–186 551.509.616:551.515.11

Spar, Jerome (*Dept. of Met. & Oceanog., N. Y. Univ.*), **Project Scud.** *Meteorological Monographs*, Boston, 2(11):5–23, July **1957.** 17 figs., 3 tables, 8 refs. **DWB, DLC**—Cloud seeding with dry ice and silver iodide was conducted over the east coastal region of the U. S. during the periods January–April 1953 and December 1953–April 1954, to determine the effects of seeding on cyclone development. The experimental units employed were cases of potential cyclogenesis. After selection of the cases, seeded and control instructions were separated by a randomization procedure in consecutive pairs. Test variates were 24-hr area integrated precipitation and sea level pressure change. The data were reduced by the method of analysis of covariance. It was concluded from the statistical analysis that if the seeding had any effect on the large scale precipitation or on the pressure field, the effect was too small to be detected against the background of natural meteorological variance. *Subject Headings:* **1. Cloud seeding experiments 2. Cloud seeding effects on cyclogenesis.**—*Author's abstract.*

10.10–187 551.509.616:551.578.7:551.507.362.1

Die Steighöhe der Hagelabwehr-Raketen. [Height of ascent of hail control rockets.] *Die Grüne*, Zurich, 80(19):526–530, May 9, 1952. 5 figs., 2 tables. **DA**—Hail protection by means of rockets has been used in the past four years on the Magadino Plain and elsewhere in northern Switzerland. Trigonometric measurements by a telemetric detachment of the Swiss Army were conducted at Cugnasco on Sept. 15, 1951, a clear calm day, perfect for visible ascent recordings. The 64 rockets fired were from four different manufacturers and included 9 different types with a variety of demolition charges and firing mechanisms. The adequacy of the rockets could not be determined because they did not reach their targets. Minimum elevation reached was 800 m, maximum 1200–1300 m. A graph features the peculiar tendency of S.S.E. displacement of the point of detonation. The tables feature details pertinent to the rockets. *Subject Heading:* **1. Hail rockets.**—*W.N.*

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

DENSITY AND COMPOSITION OF THE ATMOSPHERE

See also: **Satellite obs. of atmos. composition** (Nicolet), 10.10–93; **Satellite obs. of upper atmos.** (Schmidt), 10.10–96; **Satellite density obs.** (Sterne), 10.10–157; **CO_2 hypothesis of climatic changes** (Flohn), 10.10–295.

10.10–188 551.510.41/2:551.574.11

Oddie, B. C. V. (*Met. Office, Air Ministry, Kingsway, W.C.*2), **Atmospheric chemistry.** *International Journal of Air Pollution*, N. Y., 1(1/2):114–119, Oct. **1958.** fig., 8 refs. **DWB, DLC**—A network of about eighty stations has been established in northwest Europe for the study of air-borne inorganic salts. Samples are taken in two ways: (a) by simple collection of rainwater, (b) by passing air through an absorbent solution. The sampling period is a calendar month. Rainwater is quantitatively analyzed for S, Cl, NO_3-N, NH_3-N, Na, K, Mg, Ca, HCO_3, conductivity and pH, the air sample for S, Cl, NH_3-N, Na, K, Mg, and Ca. In Scandinavia (the only region for which studies have yet been published) nearly all the air-borne material is natural, and the great majority is of marine origin. Unexpectedly large amounts of sulphur and ammonia originate in the sea, presumably by the decay of organic matter. The amount of air-borne material is greatest on the windward or southwest coast and decreases very rapidly inland; it seems to be lost mostly by direct deposition on the ground and vegetation, though some is carried upwards by turbulent diffusion. Washing-out by rain is not a principal cause of the decrease. It is remarkable that chloride disappears from the air more quickly than any other radical, showing that the sodium chloride is in some way decomposed. One possible explanation is that it is oxidized in the air, perhaps by ozone or sulphuric acid, and that the released chlorine or hydrochloric acid is rapidly absorbed at the ground or by vegetation. The subject is closely related to atmospheric pollution, and it is obviously desirable that the two studies should have a common policy and, as far as possible, similar methods. *Subject Headings:* **1. Atmospheric chemistry 2. Air sampling and analysis 3. Nuclei measurement networks.**—*Author's abstract.*

10.10–189 551.510.41

Blamont, Jacques-Emile and Donahue, Thomas M., **Variation saisonnière de l'abondance du sodium dans la haute atmosphère.** [Seasonal variation of the sodium abundance in the high atmosphere.] *Académie des Sciences, Paris, Comptes Rendus*, 247(4):496–498, July 28, **1958.** fig., 3 refs. **DWB, DLC**—Comparison between two theories, that of the authors and that of CHAMBERLAIN, HUNTEN and MACK, so as to investigate the intensity variation of the atmospheric emission of the sodium D lines in terms of the sodium abundance in the high atmosphere. The agreement between the two theories is excellent and it seems that the great difference between the seasonal variations of sodium abundance deduced from the application of the theory to HUNTEN's observations at Saskatoon and BLAMONT's at the Haute Provence Observatory, is a fact. In Haute-Provence, the abundance varies from 2.10^9 to 30.10^9 atom/cm^2; at Saskatoon, from 1.10^9 to 10.10^9 atom/cm^2. In Haute-Provence, two maximums are observed (November–December and end of March); at Saskatoon, only one maximum (Feb.–March). The authors wonder if this difference is not involved in the inland location of Saskatoon. *Subject Headings:* **1. Sodium in the high-atmosphere 2. Seasonal variations of sodium 3. Saskatoon, Canada 4. Haute Provence, France.**—*A. V.*

10.10–190 551.510.41:523.4

Strughold, Hubertus (*Randolph Air Force Base, Texas*), **The oxygen belt in the planetary system.** *Journal of Astronautics*, N. Y., 3(2):27–28, 52, Summer **1956.** 3 figs., table. **DLC**—The earth's atmosphere has evolved from an original hydrogen atmosphere (a sphere of reducing or reduced chemicals) to the present oxygen atmosphere. A parallel to this development is found if present planetary atmospheres are considered in respect of their distance from the sun, the more distant planets having reduced atmospheres and the closer ones oxidized atmospheres. The zone in which oxidized atmospheres are found (Mars, Earth and Venus) can be called the oxygen belt of the planetary system. Other biologically significant belts are the liquid water and the biotemperature belts. Their combination constitutes the life zone or ecosphere.

Subject Headings: **1. Origin of atmosphere 2. Atmospheric composition 3. Planetary atmospheres.**—*G.T.*

ATMOSPHERIC POLLUTION

See also: **Aerosols** (Avy), 10.10–14; **Turbulent diffusion effects on atmos. pollution** (Priestley et al.), 10.10–22; **Pollen and mold in the atmos.** (Gourmel et al.), 10.10–299.

10.10–191 551.510.42:533.15:533.6.07

Cermak, J. E. and Albertson, Maurice (*both, Colorado State Univ., Ft. Collins*), **Use of wind tunnels in the study of atmospheric phenomenon.** *Air Pollution Control Association, Annual Meeting, May 1958*, Paper No. 58–32, **1958.** 15 p. 4 figs., 8 refs., 12 eqs. **DWB** (M10.42 A298a)—Factors affecting atmospheric diffusion of gases are reviewed and the usefulness of scale models in studying local diffusion characteristics is explained. The wind tunnel reproduction of the various diffusion parameters and its accuracy are discussed. It is found that local diffusion characteristics can be reproduced in wind tunnels with a high degree of similarity thus making this technique a useful (and inexpensive) means of air pollution analysis, with particular applicability to preconstruction studies. *Subject Headings:* **1. Atmospheric pollution research 2. Diffusion of gases 3. Wind tunnel experiments 4. Scale model experiments.**—*G.T.*

10.10–192 551.510.42

Cramer, H. E. (*Mass. Inst. of Technology*), **A brief survey of the meteorological aspects of atmospheric pollution.** *American Meteorological Society, Bulletin*, 40(4):165–171, April **1959.** 4 figs., 14 refs. **DWB, DLC**—This article is intended to provide a brief survey of current knowledge of the meteorological aspects of air pollution for meteorologists and others who are not specialists in diffusion. Improved understanding of atmospheric dispersal processes has largely occurred in proportion to the amount of satisfactory empirical data available. The most comprehensive observations refer to small-scale processes, but considerable information on large-scale processes has been obtained in studies of radioactive fallout; comparable data for intermediate-scale processes of the type involved in community air pollution appear to be lacking. Although a satisfactory diffusion theory has not yet emerged, the outlook is encouraging. *Subject Headings:* **1. Atmospheric pollution 2. Diffusion theories 3. Atmospheric pollution dispersal.**—*Author's abstract.*

10.10–193 551.510.42

†Hewson, E. Wendell, **Meteorological factors affecting causes and controls of air pollution.** *Air Pollution Control Association, Pittsburgh, Journal*, 5(4):235–241, Feb. **1956.** 16 figs. (incl. photos), table, 42 foot-refs. **DWB, DLC**—The many aspects of the study of natural and artificial air pollution as affected by meteorological factors are reviewed in the light of the most recent knowledge and measurement techniques. Dispersion by wind and turbulence, inversions, fallout, rainout and washout, use of meteorology in determining sites and specifications for industrial plants, control of output of contaminants, control of aero-allergens, suggested meteorological equipment for study of wind, turbulence, lapse rates, etc. are discussed. *Subject Headings:* **1. Atmospheric pollution control 2. Meteorological factors in air pollution 3. Atmospheric pollution instruments.**—*M.R.*

10.10–194 551.510.42:546.13:551.578.11

†Junge, Chr. E. and Gustafson, P. E. (*GRD, A. F. Cambridge Research Center*), **On the distribution of sea salt over the United States and its removal by precipitation.** *Tellus*, Stockholm, 9(2):164–173, May **1957.** 6 figs., 23 refs., eqs. **DLC**—Average maps for summer and winter of the distribution of chloride concentration in rainwater over the United States are presented, and an attempt is made to explain them quantitatively. From various considerations, it must be concluded that the essential features of these maps—the drop in the Cl^- concentration along the coast and a constant level inland—are determined by large scale vertical mixing in the troposphere rather than by washout. Large scale washout appears to be rather inefficient, so that even large and hygroscopic particles, such as sea spray, can move

across continents without being effectively removed from the atmosphere. *Subject Headings:* **1. Chloride content of air 2. Chloride content of rain water 3. Large scale vertical mixing 4. United States.**—*Authors' abstract.*

10.10–195 551.510.42:551.55

Neuwirth, R., **Einige Resultate luftchemischer Untersuchungen im Zusammenhang mit der atmosphärischen Turbulenz.** [Some results of chemical investigation of the air in relation to atmospheric turbulence.] *Meteorologische Rundschau*, Berlin, 11(5):137–141, Sept./Oct. **1958.** 5 figs., 4 refs., 5 eqs. **DWB, DLC**—In connection with Rossby's and Egner's international network of investigations of atmospheric and precipitation chemistry, the author carried out experimental studies on the relationship between atmospheric chemistry and meteorological variables at a mountain and valley station in the southern Black Forest (Feldberg i. S. and Freiburg i. Br.). A statistical analysis showed that a "close correlation exists between the variation of sulfur concentration from month to month and the monthly variation of vertical temperature gradient, especially during the fall and winter months. The vertical concentration variation of the impurities manifests a straight line relationship with the vertical temperature gradient." The effect of dynamic turbulence is investigated with the aid of the Richardson number and a high correlation was found between the Richardson number and the vertical variation of sulfur concentration. Deviations from the linear relationship between the variation of nitrogen impurities with altitude and the logarithm of the Richardson number can be correlated with the frequency of south and southwest winds on the Feldberg. By means of two regression equations combining dynamic turbulence and frequency of wind direction, it is possible to compute the vertical gradient of air pollution. *Subject Headings:* **1. Turbulence effects on air pollution 2. Atmospheric pollution-weather relationships 3. Black Forest, Germany.**—*Author's summary and I.L.D.*

10.10–196 551.510.42:551.521.3

Sheppard, P. A. (*Dept. Met., Imperial Coll. London S.W.7*), **The effect of pollution on radiation in the atmosphere.** *International Journal of Air Pollution*, N. Y., 1(1/2):31–43, Oct. **1958.** 5 figs., 2 tables, 13 refs. **DWB, DLC**—Absorption and scattering by a polluted atmosphere are considered in relation to: (a) Solar radiation (wavelengths 0.3–3μ); (b) terrestrial radiation (wavelengths 3–60μ). Scattering and absorption by particulates are considered in the light of Mie theory, in regard both to the polar diagram of scattered light and to the extinction cross-section as a function of wave length, particle diameter and refractive index. Single scattering is mainly forward but multiple scattering, which is significant for transmissions less than about 0.75—transmission of solar radiation by a heavily polluted column may often be less than this limit—results in a greater fraction of backward scatter. Some observations of Waldram on polar diagrams of scatter and on transmission over the bottom kilometer of a polluted atmosphere are quoted to show that more than 30% of the solar beam may be scattered and more than 25% absorbed by the column. Of the 30% or more scattered probably less than half would be lost to the atmosphere by upward scatter. Observations of solar radiation, direct and diffuse, in central London and on its periphery, provide further values of scatter and absorption which point in the same direction as do those of Waldram. Terrestrial radiation appears to suffer significant absorption by particulates even in a rural atmosphere and it is much stronger in London. The effect is to increase the cooling rate of the bottom kilometer or so of the polluted atmosphere by as much perhaps as 2° or 3°C per day. The ground surface must then cool somewhat less by terrestrial radiation. Computations by Moller on a model atmosphere containing a given distribution and amount of particulate matter are broadly in line with this conclusion. Thus there is significant upward scatter of solar radiation by pollution—a loss of heat to the atmosphere—and a significant absorption which replaces a corresponding absorption at the ground. The absorption of solar radiation is offset by increased emission of terrestrial radiation by the layer concerned, and the latter loss will be dominant in mid-winter conditions when solar energy is necessarily small. *Subject Headings:* **1. Atmospheric pollution effects on radiation 2. Atmospheric scattering 3. Radiation transmission through polluted atmosphere.**—*Author's abstract.*

STRUCTURE OF THE ATMOSPHERE—UPPER ATMOSPHERE—IONOSPHERE

See also: **Ionosphere** (Dumont), 10.10–17; **Atmos. tides** (Defant), 10.10–33; **Planetary atmos.** (Newkirk), 10.10–86; **Satellite investigation of ionosphere,** 10.10–90; **Met. conditions for high level flying** (Pchelko), 10.10–101; **High level flying** (Veranneman), 10.10–104; **Atmos. models** (Sterne), 10.10–157; **Stratospheric structure and circulation** (Teweles), 10.10–228; **Tropopause fronts** (Reed, Danielsen), 10.10–243; **Turbulent heat flux in lower troposphere** (Gaĭgerov, Kastrov), 10.10–271; **Upper air turbulence** (Matveev), 10.10–271; **Seasonal changes in upper air winds** (Vestine), 10.10–277.

10.10–197 621.396.8:523.164:551.510.52/3

Ellis, G. R. (*Radio Res. Labs., C.S.I.R.O., Australia*), **The trapping of cosmic radio waves beneath the ionosphere.** *Journal of Atmospheric and Terrestrial Physics*, London, 13(1/2):61–71, Dec. **1958.** 11 figs., 5 refs., 4 eqs. **DLC**—The observation of cosmic radio noise at frequencies less than the local ionospheric critical frequency is discussed. It is shown that this effect may adequately be explained in terms of the trapping of the radiation between the ionosphere and the ground. Wherever there is a horizontal gradient of critical frequency in an ionospheric layer, incoming extra terrestrial radiation may be reflected by the layer after one ground reflection and may subsequently propagate by hop transmission for large horizontal distances beneath the layer. A method of calculating the amplitude of the trapped radiation at any distance is given, allowing for all possible modes. *Subject Headings:* **1. Cosmic radio wave trapping below ionosphere 2. Ionospheric reflection of cosmic radio radiation 3. Radio astronomy.**—*Author's abstract.*

10.10–198 551.510.528:551.587

Lobanova, V. Ia., **Metodika sostavleniia aeroklimaticheskikh charakteristik tropopauzy.** [Method of determining the aeroclimatological characteristics of the tropopause.] *Tashkent. Geofizicheskaia Observatoriia, Trudy*, No. 11/12:50–53, **1956.** fig. **DLC**—A method of determining the boundaries of the tropopause is outlined. It is based on a method introduced by I. A. Klemin according to which the tropopause layer is considered as a compound layer consisting of a layer of upper disturbed troposphere and of a layer of substratosphere. The upper disturbed layer is characterized by a positive vertical temperature gradient and the substratosphere layer by a temperature inversion. The layers are separated by a surface of minimum temperature called "characteristic" surface. The surface of minimum temperature is considered to be the lower boundary of the troposphere. *Subject Headings:* **1. Tropopause height 2. Upper air climatology.**—*A.M.P.*

10.10–199 551.510.53:551.557.33(443.62)

Barbé, Georges, **Sur la variation saisonnière de la circulation atmosphérique entre le sol et l'altitude de 30 km, à Trappes près de Paris, entre le 1er octobre 1957 et le 1er octobre 1958.** [Seasonal variation of atmospheric circulation between the surface and an altitude of 30 km, at Trappes near Paris, from Oct. 1, 1957 to Oct. 1, 1958.] *Académie des Sciences, Paris, Comptes Rendus*, 247(22):2025–2028, Dec. 1, **1958.** 4 tables, 4 refs. **DWB, DLC**—The results of almost daily soundings at high altitude between Oct. 1, 1957 and Oct. 1, 1958 show a seasonal variation, both in the strength and direction of the wind, of atmospheric circulation in the upper atmosphere. In autumn, spring and summer, the stratospheric circulation above 20 km has a "zonal" character which is more and more pronounced as the altitude increases. The characteristic features of the seasonal distribution of wind speed are as follows: a) existence between 17–18 and 24–25 km of a sharply marked minimum in spring and summer, a little less apparent in autumn and difficult to discern in winter; b) in the stratosphere, between 25 and 35 km, the winds are weak in summer (60 km/h), maximum in winter when they may reach 300 km/h and strong in autumn (200 km/h); in spring a speed of 150 km/h is seldom reached. *Subject Headings:* **1. Stratospheric circulation 2. Seasonal stratospheric wind variation 3. Trappes, France.**—*A.V.*

10.10–200 551.510.535:551.507.362.2

Al'pert, Ia. L., **Ionosfera i iskusstvennye sputniki Zemli.** [The ionosphere and artificial earth satellites.] *Priroda*, Moscow, No. 10:71–77, Oct. **1958.** 3 figs. **DLC**—The author

discusses the pre-sputnik knowledge on the concentration and density of electrons above th earth and the importance of more precise data on the distribution of electrons with altitud above 100 km, the effective frequency of collisions of electrons with other heavier gas particle and the small scale inhomogeneities in the atmosphere. The possible origins of these inhomo geneities, which are characterized by fluctuations of electron concentration, are considered namely: ionospheric turbulence and longitudinal plasma waves. The special problems arisin in the use of satellites to study the atmosphere are considered. These result from the use o radio signals to measure various parameters and the complexity of effects occurring in th vicinity of the satellite. The applications of the coherent Doppler method and of the metho of observation based upon radio "rise" and "set" are discussed. *Subject Headings:* **1. Iond spheric electron density distribution 2. Satellite observation of ionosphere.**—*I.L.D.*

10.10–201 551.510.535:551.507.362.

Al'pert, Ia. L., **Sostoianie vneshneĭ ionosfery.** [The state of the outer ionosphere.] *Priroda*, Moscow, No. 6:86–87, June **1958.** table, 3 foot-refs. **DLC.** Trans. into Englis by E. R. Hope issued as *Canada. Defence Research Board, Translation* T-304-R, Sept. **1958 DWB**—The method of radio observations on the first earth satellite is described briefly and th results of such observations at 6 points during Oct. 5, 6 and 7, 1957 are summarized. Th electron concentration in the outer ionosphere diminished with altitude considerably mor slowly than it increased in its lower portion. A table is presented giving the electron con centration N/cm³ up to 3100 km and also the density of neutral particles per cm³ up to th same height. The computation of the density of the latter is described. At distances of 2000 3000 km from the earth, the electron concentration is close to 10^3–10^2 electrons/cm³ and th density of neutral particles is of the order of 1 per/cm³. Hence the atmosphere approaches th properties of interplanetary gas at 2000–3000 km. The agreement between the data on th outer atmosphere obtained by means of rockets and lunar signals is compared with thos obtained with the artificial earth satellite. *Subject Headings:* **1. Ionospheric characteristic 2. Satellite observation of ionosphere.**—*I.L.D.*

10.10–202 535.31:551.510.53

Bibl, Klaus; Paul, Adolf and Rawer, Karl, **Interprétation de l'absorption ionosphériqu en fonction de la fréquence.** [Interpretation of ionospheric absorption with respect to fre quency.] *Académie des Sciences, Paris, Comptes Rendus*, 248(7):949–952, Feb. 16, **1959** table, 5 refs., 5 eqs. **DWB, DLC**—Elaboration of a new formula which explains the measure ments relating to the reflection coefficient of the ionosphere expressed with respect to th frequency f, through use of the expression of the decrement of logarithmical absorption L This formula is written

$$L = \frac{B}{(f+f_H)^2} + N\Delta(\eta;\eta_0)$$

where f_H = gyrofrequency, $1/\eta$ = reduced frequency of normal E layer, B = non-deviative ab sorption mainly attributed to the D region, N = deviative absorption in the E region. Seasona variation of N increases with the height of sun, whereas variation of B varies in the opposit direction. The seasonal systematic variation is due rather to the deviative absorption relatin to the E region. *Subject Headings:* **1. Ionospheric reflection coefficient 2. Ionospheri absorption 3. Seasonal variation of ionospheric absorption 4. E region.**—*A.V.*

10.10–203 551.510.535:551.510.6

Chapman, Sydney and Davies, K. (*both, Brown Univ., Providence, R. I.*), **On the approxi mate daytime constancy of the absorption of radio waves in the lower ionosphere.** *Journal o Atmospheric and Terrestrial Physics*, London, 13(1/2):86–89, Dec. **1958.** fig., 7 refs., 3 eqs **DLC**—By day, the absorption of very long radio waves is nearly constant, and decidedly greater than at night; it originates in the lower ionosphere. It is here explained as due t electrons generated mainly by photodetachment from negative ions, supposed to be much greater in number, and nearly constant by day and night. The optical depth of the leve concerned must be small for the photodetaching radiation, but large for the radiations able t ionize neutral particles. *Subject Heading:* **1. Ionospheric radio wave absorption.**—*Authors abstract.*

10.10–204 551.510.535

Coroniti, S. C. and Penndorf, R. (*Electronics Res. Lab., A VCO Manuf. Corp.*), **The diurnal and annual variations of foF$_2$ over the polar regions.** *Journal of Geophysical Research*, Wash., D. C., 64(1):5–18, Jan. **1959.** 8 figs., 2 tables, 13 refs. **DLC**—Critical frequency data, foF2, are analyzed in the polar regions for the period 1954 to summer 1957. The diurnal variation is largest in winter and smallest in summer. In winter little or no diurnal variation occurs north of 75°. The amplitude increases southward up to 11 Mc/s at 60°N with a minimum around 07h and a maximum between 12h to 14h. The daily variation is fairly symmetrical around the maximum. The pronounced daily variation lasts from fall through winter till spring. The annual variation shows a regular behavior, with steep gradients occurring around sunrise and sunset throughout the year. The latitudinal differences are small in summer, of the order of 1 Mc/s or less between 60° and 80°N, but large in winter. The lines of equal foF2 seem to fall between the geographic and geomagnetic latitude circles. The diurnal variation in the Antarctic is different from that in the Arctic during the southern summer (November to February) because a dip occurs around noon. *Subject Headings:* **1. Diurnal F$_2$ layer critical frequency variations 2. foF$_2$ variations 3. Polar Region.**—*Authors' abstract.*

10.10–205 551.510.535

Dieminger, Walter E. (Max-Planck Inst. for Aeronomy), **Clouds in the sporadic E-layer.** *Annales de Géophysique*, Paris, 15(1):23–30, Jan./March **1959.** 8 figs., 24 refs. French summary p. 23. **DLC**—The sporadic E layer with its drifting clouds is still an unsolved problem of the ionosphere. Several questions are discussed here. To explain the fact of transparency, the hypothesis fitting best the bulk of observations is that of a nebulous structure of the Es layer. Horizontal extension, development and drifting away of these banks of clouds are studied. Finally, the possible origins of auroral E and sporadic E in moderate and equatorial latitudes are discussed. Auroral E seems to be produced by solar corpuscles penetrating as low as 100 km, or by radiation (probably X-rays) produced by the solar particles at greater heights. The release of energy stored during daytime by dissociation or ionization seems to be the most probable origin of sporadic E. *Subject Headings:* **1. E layer transparency 2. Drifting ion cloud banks 3. Auroral E layer origin 4. Sporadic E in nonpolar regions.**—*A. V.*

10.10–206 539.17:551.510.535(969)

Lepechinsky, Dimitri and Davoust, Claude, **Quelques effets d'explosions nucléaires sur les sondages ionosphériques verticaux.** [Some effects of nuclear explosions on vertical ionospheric soundings.] *Académie des Sciences, Paris, Comptes Rendus*, 248(8):1203–1206, Feb. 23, **1959.** 2 tables, ref. **DWB, DLC**—Study of ionograms recorded at Tahiti on Aug. 1, 1958 and of those recorded at Maui (Hawaiian Islands) and at Rarotonga (Pacific) on Aug. 12, 1958 when explosions of atom bombs were scheduled in the Pacific Ocean. This study gives evidence of a very abnormal absorption. This ionospheric effect due to atomic explosions can be explained through the intense warming up of the lower ionosphere, causing an increased absorption going as far as "black-out" in the regions at less than 1000 km from Johnston Island. The radius of "ionospheric influence" of the atomic explosions seems to have reached about 3500 kms for the bomb of Aug. 1 and about 5000 kms for the bomb of Aug. 12. *Subject Headings:* **1. Nuclear explosion effects on ionospheric soundings 2. Ionospheric absorption 3. Pacific Ocean 4. Hawaiian Islands.**—*A. V.*

10.10–207 551.510.535:523.746

Mæhlum, Bernt (*Norwegian Defence Res. Establ.*), **The diurnal- and sunspot-cycle variation of the layers *E*, *F1* and *F2* of the ionosphere as observed in Norway during the period 1932–1956.** *Geofysiske Publikasjoner*, Oslo, 20(6), Feb. **1958.** 14 p. 15 figs., tables, 6 refs., eqs. **DLC, DWB**—Standard methods have been applied in order to study the diurnal variation of the critical frequencies of the E and the F1 layers, and the seasonal and sunspot-cycle variation of the critical frequencies of the E, F1 and F2 layers and the transmission factor (M 3000)-F2. The study is based mainly upon observations obtained at Kjeller and at Tromsö, although for part of the study some recent observations from Spitzbergen are also included. In order to study the variation of the critical frequencies of the E, F1 and F2 layers with sunspot activity, observations obtained at the same time of the day and the same month

for all years were selected. Reasonably good linear correlation between the critical frequencie and the 13-monthly running mean of the sunspot number, W, were obtained. The sensitivit of the critical frequency to sunspot activity for the E and the F1 layers showed a clear maximu in the summer, in agreement with the Chapman theory. The noon values of the sensitivit for the F2 layer showed a minimum in the summer both at Kjeller and at Tromsö. The diurna variations of foE and foF1 are found to obey reasonably a $\cos^n x$-law, and the exponent n found to vary with season and latitude. The spread of the daily observations from the monthl median values was studied by means of the observed quartile ranges deduced from the observe values of foF2 at Kjeller for those years when the observations have been made by the NDRE The quartile range seems to increase with the magnitude of the monthly median value and wit sunspot number. A greater spread was observed by night than by day. Finally, the correla tion between the transmission factor (M3000)-F2 and the sunspot number W was studied fo each month separately, and was found to be rather good. A study of the seasonal variation o the transmission factor concludes the work. *Subject Headings:* **1. Diurnal ionospheric varia tions 2. Sunspot effects on ionosphere 3. Norway.**—*Author's abstract.*

10.10–208 551.510.535:550.38

Maehlum, Bernt (*Norwegian Defence Res. Estab.*), **The diurnal variation of *foF2* near th auroral zone during magnetic disturbances.** *Journal of Atmospheric and Terrestrial Physic* London, 13(1/2):187–190, Dec. **1958.** 3 figs., 7 refs. **DLC**—During magnetic storms th critical frequency of the F2 layer usually decreases and this well known effect (APPLETON an INGRAM, 1935) has been the subject of numerous statistical studies. Distinguishing betwee disturbed and quiet days, the departure in the critical frequency, Δ foF2, due to magnet storms can be studied more closely. It has been shown that the variation in Δ foF2 can b separated into two components, a S_D-component which depends on local time and a D component which depends on storm time (FUKUSHIMA, 1949; MARTYN, 1951). The aim o this note is to study the S_D-component for some stations in Scandinavia and Great Britai It will be shown that the S_D-variation observed at Longyearbyen (80°N) is similar to tha observed at middle latitude stations, but the S_D-variation at Tromsö (70°N) is reverse There is thus an analogy with the latitude effect of the geomagnetic storms, where the S_D current systems are reversed within the auroral zone (FUKUSHIMA, 1953). *Subject Heading* **1. Diurnal F2 layer critical frequency variations 2. Magnetic effects on ionosphere 3. Mag netic storms 4. Arctic ionosphere.**—*Author's introduction.*

10.10–209 551.510.535:551.594.12:551.590.2

Minnis, C. M. (*DSIR Radio Res. Station, Ditton Park, Slough, Bucks*), **Ionospher changes at Singapore during the solar eclipse of Dec. 14, 1955.** *Journal of Atmospheric an Terrestrial Physics*, London, 13(3/4):346–350, Feb. **1959.** 3 figs., table, 2 refs., 2 eqs. **DLC** The E and F1 layer data obtained at pairs of stations during the eclipses of 1952 and 195 were consistent in each occasion with a single model for the distribution of sources of ionizin radiation on the sun. The results obtained at Singapore in December 1955 can not be explaine in terms of any likely distribution. It seems possible that vertical movements, and the co sequent invalidity of the Chapman theory, may have been responsible for this discrepanc No significant change occurred in the critical frequency of the F2 layer but there is evidence o a complex redistribution of ionization in the lower part of the F layer. *Subject Heading* **1. Ionospheric ionization during eclipse 2. Solar eclipse effects on ionosphere 3. F-laye ionization.**—*Author's abstract.*

10.10–210 551.510.53

†Nicolet, Marcel (*Royal Met. Inst. Uccle, Belgium*), **La thermosphère.** [The therm sphere.] *Annales de Géophysique*, Paris, 15(1):1–22, Jan./March, **1959.** 8 figs., 4 tables, 3 refs., 38 eqs. French and English summaries p. 1–2. **DLC.** Also reprinted as: *Belgiu Institut Royal Météorologique, Contributions*, No. 48, **1959.** 22 p. 8 figs., 4 tables, 34 ref **DLC**—An analysis of the pressure measurements below 120 km shows that there is an extrem minimum of temperature at the mesopause and that the temperature at the bottom of th thermosphere is as low as 150±20°K. An examination of the interrelationships betwee photodissociation and recombination of oxygen reveals that the conventional hypothes

dealing with a constant oxygen-nitrogen ratio cannot be used for the thermosphere. Since all atmospheric models employ a law of vertical distribution of the mass density $\rho = 1.3\, n(N_2) m(N_2)$, the physical properties of the lower thermosphere have been modified. It has been shown that atomic oxygen concentration can reach values between 50% and 100% of the molecular nitrogen concentration at 100 km and 110 km, respectively. These two extreme values, differing only by a factor of two, lead to a variation of the mass density completely different from previous analyses. In order to use only one model for computations, $n(0) = \frac{1}{2}\, n(N_2)$ has been assumed at 110 km and above that height it is found that all constituents are in diffusive equilibrium. Using the general criterion of the diffusion time, defined by MANGE to give times corresponding to the same percentage concentration change at all altitudes, it is shown that times corresponding to a change from a mixing distribution to a diffusion distribution can be found. Diffusion of all constituents from the mixing state is completed in about one day when it begins at 120 km and needs at least one week when it begins at 100 km. Therefore, neglecting a transition region, vertical distribution subject to diffusion was adopted at 110 km. Assuming that there is an energy flow descending as heat in the upper part of the thermosphere according to CHAPMAN'S theory, the temperature distribution is determined in a steady state by downward conduction in atomic oxygen. Results of computations are given up to 500 km showing how the density varies according to energy fluxes varying between 0.1 erg cm^{-2} sec^{-1} and 1 erg cm^{-2} sec^{-1}. The effect of atomic hydrogen has not been considered because it is assumed that its role is not very important below 1,000 km. A final indication has been made in connection with the dissociation of molecular nitrogen. It is shown that nitric oxide and atomic nitrogen are interrelated and atomic nitrogen remains a minor constituent which does not affect the atmospheric mean molecular mass. *Subject Headings:* **1. Thermosphere 2. Temperature of the mesopause 3. Temperature distribution 4. Oxygen dissociation 5. Thermospheric diffusion.**—*Author's abstract.*

RADIO METEOROLOGY

See: **Ionospheric radio wave absorption** (Chapman, Davies), 10.10–203.

RADIOACTIVITY

See also: **Radioactive fallout,** 10.10–39.

10.10–211 551.510.7

Iakovlev, A. F., **O forme deĭstvuiushchikh i registriruemykh anomaliĭ pri aero-gamma-s"emke.** [Form of actual and recorded anomalies of the gamma field during aerial surveys.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 5:594–604, **1958.** 8 figs., table, 5 refs., 36 eqs. **DLC**—The author presents an approximate analytical expression for the gamma-field in the atmospheric layer near the ground. The expression contains two variable parameters and describes satisfactorily the anomaly field in the atmosphere for different areas. The form of an anomalous gamma field in the layer near the ground on the basis of its profile is analyzed by examining its intensity, which is proportional to the number of gamma quanta recorded in a unit of time by the gamma receiver, placed at a given point in the field and having an isotropic angular characteristic, linear spectral characteristic, and dimensions relatively small to the free run of the gamma quanta in the atmosphere. By means of the formula

$$I(x_1 y) = \frac{1}{2\pi} \int_s I_0(\xi\eta) \exp\left(-\mu \sqrt{(\xi - x)^2 + (\eta - y)^2 + h_2}\right) \frac{h d\xi d\eta}{\left[(\xi - x)^2 + (\eta - y)^2 + h^2\right]^2}$$

the intensity of the gamma at a distance h from a plane gamma irradiated mineral formation with an arbitrary distribution above the zero gamma field ($I_2(\xi,\eta)$ can be computed. Equations are developed for anomalous curves $w_1(x)$ in which the profile is over the center of an area (point area), and sideways from the area at a given distance from its center, where the profile is across the extended area (linear area) and a radiating area of width 2d (the profile extends across the area, which is assumed to be infinite). The equations of anomalous curves are all approximated by the function $\exp(-x^2/\alpha^2)$. The recording of the gamma fields varying with time in practical aerial gamma surveying, is achieved by means of a radiometer with an integrating RC cell, and with the aid of the law of variation of intensity of gamma field along

the profile, namely $\omega(x) = \exp(-x^2/\alpha^2)$. *Subject Heading:* **1. Radioactivity in the atmosphere** —*I.L.D.*

10.10–212 551.501:551.510.7

Belousov, A. Z.; Novikov, Iu. V.; Oreshko, V. F. and Polivoda, V. I., **Metodika opre deleniia estestvennogo radioaktivnogo fona atmosfernogo vozdukha, obuslovlennogo aero zoliami.** [Method of determining natural atmospheric radioactivity due to aerosols.] *Gigien i Sanitariia*, Moscow, 23(10):64–69, Oct. **1958.** 3 figs., table, 5 refs., 8 eqs. **DLC**—A detaile description is given of the aspiration method for collecting air samples for measuring th concentration of short lived radioactive aerosols in the atmosphere. The filters used and th counters are described. The results of experiments to determine the quantity of air necessar to aspirate in order to obtain exact measurements show that as the volume of aspirated a increases the number of aspirated particles on the filter increases and the measurement erro decreases. For a volume of air of 1800–3000 liters the measurement error was 2% and th time of aspiration was 30–50 min at a rate of 60 liters/min. The optimum velocity of aspiratio of air lies within a range of 6.37 to 22.2 liters/min cm². If the concentration of the radioactiv isotope in the air investigated is constant then for constant aspiration the rate of accumulatio of radioactive isotopes on a filter, taking into account their disintegration during samplin is given by $dN/dt = q - \lambda N$, where $q = A \cdot v_0/\lambda$ = rate of accumulation of radioactive isotopes i the atmosphere (in atoms/min); N = rate of disintegration of isotopes (in atoms/min); A = radio activity of air (in atoms/liter); λ = constant rate of radioactive disintegration, and v_2 = rate o aspiration (in liters/min). When integrated from o to t this equation becomes $N = 8/\lambda(1 - e^{-\lambda t}$ The procedure including the equations for determining the various terms in the equations an presented. *Subject Headings:* **1. Radioactivity measurement techniques 2. Radioactiv aerosols 3. Air sampling and analysis.**—*I.L.D.*

10.10–213 551.501:551.510.7

Belousov, A. Z.; Novikov, Iu. V.; Oreshko, V. F. and Polivoda, V. I., **Radioaktivnyĭ fo atmosfernogo vozdukha obuslovlennyĭ aerozoliami.** [Radioactive background of the at mosphere due to aerosols.] *Gigiena i Sanitariia*, Moscow, 23(10):17–22, Oct. **1958.** 2 figs 5 tables, 6 refs. **DLC**—The results of determinations of atmospheric radioactivity at thre points within a city and in its surroundings are presented. Air samples were collected a heights of 1.5–2 m above the earth's surface and examined for aerosol content of α- and β activity. During a year 967 samples were collected. Data are given on the monthly mean maximum and minimum concentrations of active α and β aerosols at different points withi Moscow, monthly maximum, minimum, and mean α and β concentrations in the outskirts of th city, concentration of dust and of α and β aerosol in the atmosphere and periods of sem disintegration of α and β aerosols of air at different points of sampling in 1954. The measure ments indicate that the radioactivity produced by short lived isotopes differs slightly betwee suburbs and city; in the former the mean β radiation is $2.41.10^{-13}$ C/l and α radiation i 1.23×10^{-13} C/l; in the latter the corresponding values are 2.54×10^{-13} and 1.6×10^{-13} C/ The radioactivity is varying continuously, not only over long periods of time but also withi 24 hours. The range of fluctuations lies within the limit of one order of magnitude; they ar apparently produced by weather conditions. With increasing atmospheric dust content th radioactivity of atmospheric aerosol increases. The isotope composition of atmospheri aerosols varies slightly and the mean half-life period of radioactive aerosol for both α and radiation is 34–36 min. *Subject Headings:* **1. Radioactivity measurement techniques 2. Radio active aerosols 3. Moscow, U.S.S.R.**—*I.L.D.*

10.10–214 551.510.72:631.

Barbier, G.; Huguet, F.; Michon, G. and Tyszkiewicz, E., **Sur la prévision d'accumulatio dans le sol et dans les récoltes, d'éléments radio-actifs de longue période apportés à régim constant.** [The forecast of accumulation in soil and crops of long-period radioactive element supplied on a continuous basis.] *Académie des Sciences, Paris, Comptes Rendus*, 247(25):2434 2436, Dec. 22, **1958.** 2 refs. **DWB, DLC**—Statement of a method to determine the increas of radioactive elements in crops according to the quantity accumulated in the soil, and repor

of some experiments proving that the amount of radioactive elements annually removed by crops is small with respect to their annual rate of decrease. These experiments were made under the usual conditions and included the irrigation of vegetables by means of water with an admixture of Sr^{99} or Cs^{137}. *Subject Headings:* **1. Artificial radioactivity 2. Radioactivity in crops 3. Avignon, France.**—*A. V.*

10.10–215 551.510.72

Fontaine, M., **Les risques de pollution par des éléments radioactifs: vues générales.** [Risks of pollution by radioactive elements: general survey.] *Académie d'Agriculture de France, Paris, Comptes Rendus*, 44(18):862–874, Dec. 10 and 17, **1958.** 10 refs. **DLC**—The development of utilizing atomic energy in several fields involves risks of pollution. General survey of the principal pollution sources: nuclear and thermonuclear explosions, experimental researches using radio elements, pollution owed to the industrial developments for the peaceful use of atomic energy. Comments on the dangers arising from pollutions of various types. *Subject Headings:* **1. Atmospheric pollution 2. Artificial radioactivity.**—*A. V.*

10.10–216 551.510.721

Bauer, Norman (*Utah State Univ.*), **Fallout near Nevada test site.** *Science*, Wash., D. C., 128(3314):40, July 4, **1958. DLC**—Author is alarmed by the lack of public information on the radioactive danger facing the population in the vicinity of the Nevada test site. One hundred "Sunshine units" of Sr^{90} represent the alarm level for adults; it is lower for children. In the absence of actual data, author estimated by a method that checked well against the Sr^{90} data for the Pacific Islands and found that areas which received 4 Roentgens of gammas probably by now have 245 ± 50 mc Sr^{90} per sq mi of soil. It is possible that residents of southern Utah will carry in excess of one hundred "Sunshine units" by 1970. The findings are to be published in detail in the 1957 **Proceedings of the Utah Academy of Sciences, Arts and Letters.** *Subject Headings:* **1. Radioactive fallout hazards 2. Strontium^{90} local fallout 3. Nevada.**—*W. N.*

10.10–217 551.510.721:551.577.7

Gerlach, Walther; Stierstadt, Klaus (*both, Munich*) and Zeising, Ilse (*Kempten*), **Untersuchungen über radioaktive Niederschläge und die Aktivität der Luft, 4.** [Investigation of radioactive precipitation and atmospheric radioactivity, Pt. 4.] *Atomkernenergie*, Munich, 3(6):222–227, June **1958.** 16 figs., 4 tables. **DLC**—Measurements of radioactivity in air and precipitation were continued at four stations in southern Bavaria. This report covers the second half of 1957 (for Pts. 1–3, *see* 9C–42, March 1958, *MAB*). It includes daily values of precipitation and dust radioactivity and graphical analyses of various relationships, such as average background activity for each liter of rain (considering or disregarding precipitation intensity), values per m^2 surface (by rain, dust, and total), relation between date of rain and explosion date, Sr^{90} activity, etc. Two different filter methods are discussed and compared. *Subject Headings:* **1. Radioactivity in the atmosphere 2. Radioactive precipitation 3. Bavaria, Germany.**—*G. T.*

10.10–218 551.510.721

Israël, H. (*Aachen*) and Reifferscheid, H. (*Offenbach*), **Bemerkungen zur radioaktiven Verseuchung der Atmosphäre.** [Notes on the radioactive contamination of the atmosphere.] *Atomkernenergie*, Munich, 3(7):255–260, July **1958.** fig., 3 tables, 8 refs. German and English summaries p. 255. **DLC**—Seeking an answer to the question of how far it is justified to generalize the results of individual measurements of radioactivity, the authors examine (and illustrate by the example of radioactive debris propagation following a Nevade explosion) the various meteorological factors involved in the distribution of natural and artificial radioactivity (diffusion, exchange, vertical divergence, precipitation, etc.) and find that the diversity of weather conditions affecting fallout renders single measurements unrepresentative. Only measured values expressed in terms of climatic or synoptic averages may be considered as significant (although peak values exceeding permissible dosage have to be met by protective measures). *Subject Headings:* **1. Radioactivity in the atmosphere 2. Radioactive fallout measurement.**—*G. T.*

10.10–219 551.510.721(410)

†Russell, R. Scott (*Agricultural Res. Council Radiobiological Lab., Grove, Wantage, Berks*). **Deposition of strontium-90 and its content in vegetation and in human diet in the United Kingdom.** *Nature*, London, 182(4639):834–839, Sept. 27, **1958.** 6 tables, 20 refs., 2 eqs. **DWB**—World-wide fallout surveys and domestic field experiments involving application of radioactive SR^{90} to surface subsequently agriculturally treated are discussed. Extent of SR^{90} from various soils and plants is tabulated, as well as a comparison of the observed SR^{90} level in milk and vegetables in the U. K. with levels expected from soil absorption. A comparison between SR^{90} content in milk in the U. K. and U. S. is provided and it shows the danger by extrapolating regionally. Theoretical results of future trends as based on the current SR^{90} rate of fallout are included. It is tentatively concluded that the rate of SR^{90} from ground—via milk produce—into the human system is an inadequate analysis. Plant and crop field surveys of some years appear to be wholly inadequate for conclusions as to the complex relationship involved. *Subject Headings:* **1. Strontium^{90} in human diet 2. Strontium^{90} fallout.**—*W.N.*

10.10–220 551.510.721:551.509.58

Spohn, Clifford A. (*U. S. A. F., Hq., Air Weather Service*), **Meteorological problems in estimating radioactive dispersion and fallout.** *American Meteorological Society, Bulletin* 39(3):152–153, March **1958. DWB, DLC**—The fallout problem was not acute while nuclear weapons were being exploded; only with the advent of thermonuclear weapons did the hazard become significant. Meteorological assumptions of constant rate of fall (depending on size of particles), representativeness of upper air wind sounding at place of explosion, use of selected levels to represent winds for 5000 ft deep layers, and fall on a level surface of a specified elevation, create errors which are serious in forecasting fallout patterns and dispersion of the suspended particles after a short time. The U. S. W. B. and U. S. A. F. Air Weather Service have been studying the problem for over a year to improve forecasts by introducing more sophisticated concepts. *Subject Heading:* **1. Radioactive fallout probability forecasting.**—*M.R.*

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE

See also: **Turbulent transfer** (Priestley), 10.10–11; **Turbulent flow** (Thompson), 10.10–28; **Vertical temp. gradient** (Gião, Roulleau), 10.10–129; **Graphical barotropic prediction** (Kusano), 10.10–174; **Calculating pressure distribution from turbulent exchange** (Mkhitarian), 10.10–265; **Austausch-nuclei relationships** (Podzimek), 10.10–286.

10.10–221 551.511.6:551.551

Belousov, S. L., **Ob otsenke oshibok approksimatsii pri reshenii uravneniia perenosa vikhria metodom posledovatel'nykh priblizhenii.** [Evaluation of errors of approximation in the solution of the equation of eddy transport by successive approximation.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 9:1145–1150, Sept. **1958.** ref., 36 eqs. **DLC**—The approximation errors are evaluated on the assumption that Poisson's equation can be solved numerically by the method of successive approximation. It is assumed that the initial field of the geopotential is given in the form of a single wave and the magnitude of the error of approximation is determined as the difference between exact solutions of differential equations and a corresponding difference equation. The approximate solution of the Poisson difference equation $\Delta_s u = A \sin(\mu x + \gamma y)$ is illustrated and the approximation errors are considered in the numerical solution of the vortical transport equation, it being assumed that the integration for time is carried out in successive stages (Euler's method). *Subject Headings:* **1. Eddy transfer theories 2. Successive approximation method.**—*I.L.D.*

10.10–222 551.511:551.46:551.515.8

†Manabe, S. (*Geophysical Inst., Tokyo Univ.*), **On the estimation of energy exchange between the Japan Sea and the atmosphere during winter based upon the energy budget of both the atmosphere and the sea.** *Meteorological Society of Japan, Tokyo, Journal, Ser.* 2, 36(4) 123–134, Aug. **1958.** 8 figs., 3 tables, 23 refs., 12 eqs. **DWB, DLC**—First, the amount of both sensible and latent energy exchange between the Japan Sea and the atmosphere during winter were computed on the basis of the balance requirement of energy in the atmosphere. Ex-

planation of the method adopted here was made in the preceding paper **On the modification of airmass over the Japan Sea when the outburst of cold air predominates** (*see* 10.4–202, April 1959, *MAB*). The mean amount of supplied heat during January and February 1955 thus obtained is as much as 555 cal/cm²/day, though it is considerably smaller than that during the period of typical outburst of cold air at the end of December 1954 (1030 cal/cm²/day). On the other hand, the mean amount of evaporation during winter is about 5.6 mm/day which corresponds to 340 cal/cm²/day, and is considerably smaller than that of sensible heat, though Bowen's ratio (6) is nearly equal to unity over the Japan Sea during this season. Finally, in order to verify these results, the amount of energy exchange was estimated based upon the balance requirement of the energy of sea water. *Subject Headings:* **1. Energy exchange sea-atmosphere 2. Air mass modification 3. Sea of Japan.**—*From author's abstract.*

10.10–223 551.511.6:533.15:536.24

Schmidt, F. H. (*Royal Netherlands Met. Inst.*), **On the diffusion of heated jets.** *Tellus*, Stockholm, 9(3):378–383, Aug. **1957.** 2 figs., 8 refs., 13 eqs. **DWB, DLC**—A general expression is obtained for the propagation of a heated jet in a stagnant environment. It is shown that W. SCHMIDT's and TOLLMIEN's solutions are contained in the general one. A new cross-sectional velocity distribution is proposed which seems to be preferable to the generally accepted Gaussian distribution. *Subject Headings:* **1. Turbulence 2. Diffusion of gases 3. Heat exchange.**—*Author's abstract.*

10.10–224 551.511.32:532.52

Fortak, Heinz (*Berlin-Mariendorf, Ankogelweg*), **Über die Herleitung von allgemeinen hydrodynamischen Wirbelsätzen.** [Derivation of general hydrodynamic vorticity equations.] *Germany. Deutscher Wetterdienst, Berichte*, 5(38):33–35, **1957.** 10 refs., 35 eqs. English and German summaries p. 33. **DWB, DLC**—By introducing a freely available tensor field function and the use of definite relevant temporal differential operators which possess a concrete physical meaning, it is possible to set in a most simple manner a large number of differential and integral hydrodynamic vorticity equations from which all hitherto known vorticity theorems can be derived. The integral form of Ertel's vorticity theorem (*Akad. d. Wiss., Berlin. Kl. Math. u. Allg. Naturwiss., Sitzungsberichte*, No. 4, **1954**) and a systematization of new hydrodynamic conservation laws can be obtained. The author defines a number of differential operations which are suitable for studying the rate of change with regard to the tenure of any tensor function associated with a given time, an area or volume of particles in a fluid. With the aid of these differential operations, general hydrodynamic vorticity equations containing an available tensor function are written. And the invariance of hydrodynamic field magnitudes with respect to the application of any temporal differential operator is considered. *Subject Headings:* **1. Hydrodynamic equations 2. Ertel's vorticity theorem.**—*Author's summary and I.L.D.*

10.10–225 551.511.33:536.7

Hollmann, Günther, **Der thermodynamische Wirkungsgrad der atmosphärischen Zirkulation.** [The thermodynamic efficiency of the atmospheric circulation.] *Beiträge zur Physik der Atmosphäre*, Frankfurt a. Main, 31(3/4):177–188, **1959.** 14 refs., 55 eqs. German, English and French summaries p. 177–178. **DWB, DLC**—A new calculation is made of the thermodynamic efficiency of the atmospheric circulation which is stationary when averaged over a sufficient number of years. An earlier estimate by A. DEFANT and H. ERTEL was too low because the heat added was assumed too large. In computing the available heat one should deduct that part of the radiation which is emitted at the same temperature as radiation is absorbed, and which is therefore not available for transformation into mechanical energy. It is postulated that the entropy of the atmosphere remains constant when averaged over a sufficient number of years (entropy principle). Then the Defant-Ertel formula can be further developed leading to a relation analogous to Clausius' inequality. This relation permits one to derive for the thermodynamic efficiency an intuitively plausible formula. The mean temperature of the heat and cold source is uniquely defined. The relative efficiency, that is the ratio of the irreversible to the reversible (ideal) efficiency, is smaller the larger the ratio of dissipation and surface work of the wind stress. With the aid of data given by LETTAU it is

estimated that the relative efficiency is 30% and the absolute (irreversible) efficiency 5%. *Subject Headings:* **1. Thermodynamics of the atmosphere 2. Thermal efficiency 3. Defant-Ertel formula.**—*Author's abstract.*

10.10–226 551.511.33:551.515.8

*Shcherbakova, A. Ia. and Bregina, A. Iu., **Izmenenie teplo- i vlagosoderzhaniia vozdushnykh mass v protsesse transformatsii v umerennykh shirotakh Evrazii.** [Changes in the heat and moisture content of air masses during their transformation in moderate latitudes of Eurasia.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 62(124):3–28, **1956**. 12 figs., 10 tables, 4 refs., 2 eqs. **DLC**—Preliminary quantitative estimations of effective heat and moisture transfer speeds, of horizontal dispersion air particles on the transfer path, and of quantitative characteristics of moisture and heat obtained or released by an air mass during its movement from north to south over the Eurasian continent are presented in numerous tables, graphs and charts, and discussed in detail. The study was carried out on the basis of surface synoptic charts and 850, 700 and 500 mb topography charts. *Subject Headings:* **1. Air mass transformation 2. Heat and moisture transport 3. Eurasia.**—*A.M.P.*

10.10–227 551.511.6:551.507.321

Wilkins, Eugene M. (*U. S. W. B.*), **Observations on the separation of pairs of neutral balloons and applications to atmospheric diffusion theory.** *Journal of Meteorology*, Boston 15(3):324–327, June **1958.** 3 figs., table, 9 refs., 3 eqs. **DWB, DLC**—The effect on instantaneous source diffusion of initial source size and diffusing time are studied from observations on the rate of separation of pairs of "zero lift" balloons. The data indicate that the similarity concept of eddy diffusion is applicable for the scales of diffusion on the order of several minutes, and for distances of several kilometers, thus covering the region of many practical applications. These findings provide some interesting information about the magnitude of the time dependency of the separation rate in the atmosphere. The rate of eddy energy dissipation calculated for a group of 10 runs was 70–200 cm^2 sec^{-3}. *Subject Headings:* **1. Atmospheric diffusion 2. Zero lift balloons.**—*Author's abstract.*

GENERAL CIRCULATION

See also: **General circulation energetics** (Peixoto), 10.10–31; **Arctic circulation** (Riccardi), 10.10–55; **General circulation studies** (Dzhordzhio), 10.10–127; **Graphical barotropic prediction** (Kusano), 10.10–174; **Tropical storm-circulation relationships** (Rodewald), 10.10–236; **Planetary frontal zones** (Zubian), 10.10–240; **Frontal zones and jet streams, E. Asia, N. Europe** (Pogosian), 10.10–242; **Cave air-atmos. circulation relationships** (Gressel), 10.10–297.

10.10–228 551.513:551.510.53

Teweles, Sidney (*Office of Met. Res., U. S. W. B.*), **Some variations in the vertical structure and circulation of the stratosphere.** U. S. Weather Bureau, Dec. 30, **1958.** 14 p. 12 figs. 6 refs. Prepared for the Symposium on the International Geophysical Year Sponsored by the A.A.A.S. and A.M.S., Wash., D. C., Dec. 30, **1958. DWB** (M10.53 U587so). **Comment** by R. Bilancini. *Revista di Meteorologia Aeronautica*, Rome, 19(4):48–49, Oct./Dec. **1959. DLC**—The first investigations, utilizing IGY observational results, are now being made. In meteorology, the immediate world-wide distribution and analysis of data have permitted many phenomena to be discovered in the midst of their development. Sudden warming of the polar stratosphere during the cold season has proved to be the most interesting event, and its causes are probably closely related to the fundamental energy transformations in the layers where it is observed. The synoptic stratosphere, in which day-to-day circulation changes can be followed, now extends to about the 30 km level. The periodicity of the great perturbations found at this high level seems to be at least twice as long as that of sea level disturbances. *Subject Headings.* **1. Stratospheric circulation 2. Stratospheric structure.**—*Author's abstract.*

10.10–229 551.513.1:551.588.2:629.135.1

Tardos, Béla, **Wellenforschungen in Ungarn.** [Wave investigation in Hungary.] *Schweizer Aero-Revue*, Zurich, 34(2):123, Feb. **1959. DLC**—A statement by J. Kasza has given an insight into the development of gliding in connection with wave movement. The trials of the last 30 years led to the discovery of the structure of the wave systems. It was observed that mountains (300–900 m height) were able to release wave movements up to the stratosphere. Junction with these systems is easy to realize because of the really low altitude. During 1955 and 1957 the three-engine measurement method has been employed at Gyöngyös for systematic research. One glider was employed for the measurement of the vertical area, a second one for the width and a third for the length of the wave movement. The wave systems temporarily changed rather quickly. In one case, after crossing a cold front, the system was maintained more than 36 sec. *Subject Headings:* **1. Wave movement 2. Orographic effects 3. Gliding.**—*A. V.*

10.10–230 551.513.2:551.557.5(98)

Campbell, William J., **The Arctic jet stream.** Washington (State). Univ. Dept. of Meteorology and Climatology, Contract AF 19(604)-3063, Scientific Report, No. 1, July **1958.** 41 p. 8 figs., 2 tables, 15 refs., 14 eqs. **DWB** (M(055) W319ar)—A daily tabulation of the latitudes and intensities of west wind maxima along two meridians, 20 E and 80 W, was made from a two-year series of 500 mb charts. The statistics reveal that multiple "jets" or wind maxima usually exist along both meridians, two being the most frequent number. In cases of double jets the more northerly is at an average latitude of 69° and so is here referred to as the "Arctic jet stream." The northerly jet shows an erratic seasonal variation in contrast to the middle latitude jet which oscillates in position from about 43 N in summer to about 36 N in winter. There are no significant differences in the statistical behavior of the jet streams at the two meridians. Mean cross sections of temperature, potential temperature, and normal geostrophic wind component, based on nine individual cases of pronounced Arctic jets, are presented for the cold season. The jet core is located near the 300 mb level and lies above a zone of diffuse baroclinity without sharp frontal boundaries. The tropopause dips below the 300 mb level north of the core and rises to the 250 mb level to the south. *Subject Heading:* **1. Arctic jet stream.**—*Author's abstract.*

10.10–231 551.509.31:551.513.2

Lalovski, Khr., **Kharakterŭt na atmosfernata tsirkulatsiia nad Evropa i Bulgariia prez zimata 1955–56 god i prez pŭrvata polovina na proletta na 1956 god.** [The character of atmospheric circulation over Europe and Bulgaria in the winter of 1955–56 and the early spring of 1956.] *Khidrologiia i Meteorologiia*, Sofia, No. 3:20–25, **1956.** 4 figs. Russian and English summaries p. 34–35. **DLC**—Two composite synoptic charts of Europe are presented and discussed, one for the period Dec. 1, 1955–Jan. 25, 1956 (characterized by zonal transfer of Atlantic air over Europe) and one for Jan. 26–April 10, 1956 (a period of intense meridional transfer of polar air). *Subject Headings:* **1. Synoptic analysis 2. Atmospheric circulation 3. Bulgaria 4. Europe.**—*G. T.*

10.10–232 551.513.2:551.557.5:632.187

Schaefer, Vincent J. (*Munitalp Foundation, Inc., N. Y.*), **Relationship of jet streams to forest wildfires.** *Journal of Forestry*, Wash., D. C., 55(6):419–425, June **1957.** 5 figs., table, 10 refs. **DLC.** Also issued in reprint as *Munitalp Foundation, Inc., N. Y., Occasional Papers*, No. 0029, **1957.**—The jet stream was found to be strongly associated with situations that produce "blow-up" fires in the Far West. Over a score of cases when such conditions occurred in 1955 and 1956 are tabulated (name of fire, forest, state, date, acres burned, high level jet velocity, etc.) and examples described and illustrated with jet stream cloud photographs and charts. Charts also show upper air wind direction and speeds before and during a blow-up fire in California. In some cases winds were 200 mph. The formation of Bénard cells in jet streams, examples of gusty surface winds in vicinity of jet streams, and values of atmospheric electricity and condensation nuclei at the head of the Dudley Lake fire are discussed. *Subject Headings:* **1. Jet stream-forest fire relationships 2. Fire weather 3. Western States.**—*M. R.*

10.10–233 551.513.7:551.543

Berlage, H. P. (*Royal Netherlands Met. Inst., Netherlands*), **Long periodic oscillations in the atmospheric and hydrospheric circulation of the Pacific Ocean.** *Pacific Science Congress 8th, Quezon City, Philippines, Nov. 1953, Proceedings*, Vol. IIA, pub. **1956.** p. 1106–1112. 5 figs., 13 refs. **DWB**—The "Southern Oscillation" consists of a fundamental cycle with a mean period of 2.46 years. The extent to which the Southern oscillation reaches over the globe, the seasonal variation of the character of this oscillation, etc. are discussed. *Subject Headings:* **1. Southern oscillation 2. Hydrospheric circulation 3. Pacific Ocean.**—*I.L.D.*

10.10–234 551.513.7:551.589.1

Bryson, Reid A. and Lahey, James F., **The march of the seasons.** Wisconsin. Univ. Dept. of Meteorology, Contract AF 19(604)-992, Final Report, March 1958. 41 p. 27 figs., 3 charts (fold.), tables, 16 refs. Appendix of list of Scientific Reports under the Contract. **DWB** (M11 B916ma)—The annual variations of pressure, circulation indices and synoptic patterns are discussed with respect to the "natural seasons." Finally, singularities in annual variation of synoptic patterns and indices are treated. In this study "singularities" are defined as anomalies in large or medium scale seasonal patterns of combined weather elements and not as local disturbances in annual course of one element. These singularities are illustrated for the Midwest, Caribbean and for Arizona as well as for U. S. as a whole. *Subject Headings:* **1. Natural seasons 2. Singularities in circulation 3. Caribbean.**—*M.R.*

ATMOSPHERIC DISTURBANCES

See also: **Hurricane conf.**, 10.10–9; **Tornado disasters, Texas** (Moore), 10.10–36; **Thunderstorm flights** (Kogan-Beletskiĭ), 10.10–98; **Radar obs. of tornadoes, Kansas** (Sadowski), 10.10–142; **Airplane obs. of surface pressure in tropical cyclones** (Jordan), 10.10–173; **Thunderstorm formation** (Ponomarenko), 10.10–179; **Cloud effects seeding on cyclogenesis** (Spar), 10.10–186.

10.10–235 551.515.1

Pogosian, Kh. P. and Burtsev, A. I., **Osobennosti evoliutsii poleĭ temperatury, vlazhnosti i davleniia v razvivaiushchikhsia tsiklonakh.** [Special features in evolution of the fields of temperature, humidity and air pressure in developing cyclones.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 2:244–254, **1957.** 11 figs., 7 refs., 3 tables. **DLC.** Transl. into English by N. S. Zikeev in English language ed. of the **Izvestiia,** Its *Bulletin of the Academy of Sciences of the U.S.S.R., Geophysics Series*, No. 2:128–139, **1957.** 11 figs., etc. **DWB.** Copy of translation also available in typescript form. **DWB** (M15.11 P746s)—The distribution of fields of temperature, humidity, and pressure in a system of cyclones proceeding through three fundamental stages of development is shown. Particular attention is given to explaining the impact of advection and vertical movement upon variations of the thermal field of cyclones. It is established that together with advection of cold air masses, adiabatic lowering of air temperature plays an essential role in the central and anterior parts of cyclones. *Subject Headings:* **1. Cyclone development 2. Temperature distribution.**—*I.L.D.* (*transl. of authors' abstract*).

10.10–236 551.515.2:551.513

Rodewald, Martin (*Hamburg*), **Wirbelsturm-Häufigkeit und allgemeine Zirkulation.** [Frequencies of tropical storms and general circulation.] *Annalen der Meteorologie*, Hamburg, 8(5/6):167–170, **1958.** fig., table, 6 refs. **DWB, DLC**—The author examines the question of whether the increase in the number of tropical storms during the decade 1941–1950 above the number in the decade 1931–1940 indicates a real trend or is merely the result of improved reporting. By taking the zonal index as a characteristic of the general circulation it is possible to determine the existence of a trend from a comparison of the summation curves of deviations of zonal index for 1899–1956 from the normal (1899–1939) with the deviation summation curve of the annual number of tropical storms. Apparently a circulation turning point occurred during 1931–1932; before the beginning of the 1930's the annual number of tropical storms was below normal, since then it has become above normal. An explanation of the fact

hat the production of tropical storms increases when the west wind circulation is below normal nay be found in the fact that the below normal west wind circulation is synonymous with an ntensified meandering of the upper altitude flow around the polar high, an intensified tendency owards high pressure formation in the west wind zone (blocking action) and the cut off of old lows aloft in the subtropics. The separation of the subtropical high into stronger cells rom the northerly situation favors the formation of tropical storms. *Subject Headings:* **. Tropical storm frequencies 2. Tropical circulation patterns 3. Zonal index.**—*I.L.D.*

10.10–237 551.515.23(261)

Haggard, William H. (*U. S. W. B., Wash., D. C.*), **The birthplace of North Atlantic ropical storms.** *Monthly Weather Review*, Wash., D. C., 86(10):397–404, Oct. **1958.** 11 figs., 14 refs. **DWB, DLC**—Newly adjusted tracks of North Atlantic hurricanes and tropical storms for 72 yrs provide a consistent set of data for examining the birthplaces of these storms. For 59 yrs (1899–1957) of the record, portions of the adjusted storm tracks from the point of origin of first closed circulation to the point of first hurricane intensity are presented. The origins show a regular seasonal shift eastward and later westward across an area east of the Lesser Antilles. The location of the seasonal maximum of origins in this area is thus explained. The data support MITCHELL's conclusion that the eastern Caribbean is not a birthplace of tropical storms. The results are discussed in relation to the available observational network in the hurricane breeding grounds. *Subject Headings:* **1. Hurricane genesis 2. Hurricane tracks 3. North Atlantic.**—*Author's abstract.*

10.10–238 551.515.8:612.2 551.515.8:616.24

Sauberer, F. (*Austria*), **Zur Frage der Einfluesse meteorologischer Fronten auf das Befinden des Menschen.** [The influence of meteorological fronts on human health.] *International Journal of Bioclimatology and Biometeorology*, Leiden, Vol. 1 (Pt. 4, Human Bioclimatology), **1957.** 2 p. 4 figs., 2 refs.—When the relationships between frontal passage deduced from weather maps and deaths were investigated in a large Vienna home for the aged no significant association could be found. On the other hand significant relationships could be established between pulmonary embolism and frontal passages recorded at the Zentralanstalt für Meteorologie. Histograms are presented showing the frequencies of embolisms, epileptic seizures and deaths on days with frontal passages and on each of four days immediately preceding and following the frontal passage. *Subject Headings:* **1. Frontal effects on mortality 2. Frontal effects on pulmonary embolism 3. Vienna, Austria.**—*I.L.D.*

10.10–239 551.515.8:551.577(510)

*Yeh, Tu-cheng; Kao, Yu-hsi; P'an, Ku-fang and Hsu, Shu-ying (*all, Inst. of Geophysics, Academy of Science*), **Cold air movements during the various seasons in China.** Trans. of original Chinese in *Acta Meteorologica Sinica*, Peking, 25(1):1–22, March **1954.** Trans. No. 227 (source unidentified). 22 p. numerous charts, tables. Transl. available. **DWB** (M15.8 Y43co)—On the basis of surface and upper air observations made in 1936 and during a cold front situation in 1946, cold air movements over China in summer and their relation to precipitation areas are analyzed. The study shows that invasions of polar air are frequent in China in summer. The area most often affected by such invasions is the western part of the country, but sometimes all of China is involved. The effect of these summer cold-air invasions upon precipitation is considerable. *Subject Headings:* **1. Cold air movements 2. Cold air invasions 3. Cold front effects on precipitation 4. China.**—*G.T.*

10.10–240 551.515.827:551.513:551.524.7

Zubian, G. D., **Planetarnaia frontal'naia zona v nizhneĭ stratosfere.** [Planetary frontal zone in the lower stratosphere.] *Meteorologiia i Gidrologiia*, No. 9:12–21, Sept. **1956.** 5 figs., table, 10 refs. **DWB, DLC.** Transl. into English available for reference U. S. Weather Bureau Library (M15.8 Z93p) Typescript. 19 p. fig., etc.—The author presents new data on the relationship between frontal zones in the troposphere and the lower stratosphere on the basis of a simultaneous analysis of the temperature fields at the 500, 300, 200 and 100 mb surfaces and 33 cross-sections during all the morning hours of May 1955. In this month the

stratospheric planetary frontal zones in the intermediate and high latitudes of the Northern Hemisphere are most clearly expressed in isotherm charts of the 200 mb surface. It is concluded that the frontal zones in the troposphere and stratosphere should be regarded as a uniform system which as a rule is displaced as whole and produces large deformations. The concept of planetary high altitude frontal zone can be applied fully to the lower stratosphere. Charts of isotherm at the 300 mb and 200 mb surfaces for a specific morning, graphs of the distribution of temperature differences at 500 mb and 200 mb surfaces along latitudes 55° from 20° to 140° west longitude for all mornings of May 1955, numerical data of temperature at isobaric surfaces for May 20, 1955, etc. are presented. *Subject Headings:* **1. Planetary high altitude frontal zones 2. Upper air temperature analysis.**—*I.L.D.*

10.10–241 551.515.827:551.515.1

†Newton, C. W. (*Univ. of Chicago*), **Variations in frontal structure of upper level troughs.** *Geophysica*, Helsinki, 6(3/4):357–375, **1958.** 13 figs., 40 refs. **DWB, DLC**—Some characteristic variations in structure during the formative to the advanced stages of upper trough development are described. Examples are shown wherein pronounced asymmetries of frontal structure were present. A strong high-tropospheric frontal layer found on the west side during early development of an upper trough, migrates eastward with respect to the trough itself, and appears to establish a vertical connection with an initially separate low-level polar front on the east side. The latter, although well developed at the earth's surface, appears in the early stages of trough formation (and of the primary surface cyclogenesis) to have been relatively shallow. Some possible transverse circulations connected with variations of frontal strength along the current are described. These appear to have a bearing on the process whereby upper-tropospheric and lower-tropospheric frontal systems become joined, and on the formation of certain types of cyclones. *Subject Headings:* **1. Frontal structure 2. Upper level troughs.**—*Author's abstract.*

10.10–242 551.515.827:551.513.2:551.557.5(5,4)

Pogosian, Kh. P., **Vysotnye frontal'nye zony i struĭnye techeniia v atmosfere.** [High frontal zones and jet streams in the atmosphere.] *Meteorologiia i Gidrologiia*, Leningrad, 7:3–11, July **1957.** 3 figs., table, 6 refs. **DWB**—The properties of jet streams were investigated by studying numerous cross sections of 68 jet streams outside the tropics and in the subtropics. Data are presented showing that a relationship exists between magnitude of the contrast of mean temperature in the 300–1000 mb layer in cold and warm parts of fronts and the velocity of the wind in the axis of the jet. Maximum wind velocity in the axis of the jet increases with increasing temperature contrasts. The formation of all types of jet streams, regardless of height, geographical latitude and direction, depends upon the distribution of total heat advection and development of frontal zones aloft with inherently large horizontal temperature gradient. On the basis of prevailing height and climatic zone, jet streams can be classed into extratropical, subtropical, equatorial and stratospheric. The extratropical jets are formed between warm anticyclones and cold cyclones aloft. Subtropical jet streams occur on the northern periphery of subtropical highs and warm anticyclones. During winter the jet streams occur between 25° and 35° lat., during summer 10°–15° farther north. Equatorial jets arise on the southern periphery of subtropical anticyclones (in the Northern Hemisphere). Stratospheric jets are formed in winter at heights of 20–25 km at 70°N lat. Charts showing cross sections of jet streams over Eastern Asia for summer and for winter and for Eastern Asia and Northern Europe for spring are presented. *Subject Headings:* **1. Jet stream formation 2. Upper air fronts 3. Jet stream advection 4. Eastern Asia 5. Northern Europe.**—*I.L.D.*

10.10–243 551.515.827:551.510.528

†Reed, Richard J. and Danielsen, Edwin F., **Fronts in the vicinity of the tropopause.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, Vienna, 11(1):1–17, **1959.** 11 figs., 21 refs. German and French summaries p. 1. **DWB, DLC**—From a study of five cases of pronounced fronts in the upper troposphere, it is concluded that the "waterspout" model offers the most satisfactory solution to the problem of connecting frontal boundaries and tropopauses. Composite cross sections of temperature, potential temperature, normal wind component and potential vorticity are presented for the five cases. On the basis of the po-

tential vorticity measurements it is suggested that the most likely explanation for the formation of the high-level front is a folding of the tropopause. *Subject Headings:* **1. Tropopause fronts 2. Potential vorticity.**—*Authors' abstract.*

10.10–244 551.515.83(4)

†Kaznacheeva, V. D., **K voprosu dinamiki frontogeneza.** [Problem of frontogenesis dynamics.] *Akademiia Nauk Uzbekskoĭ SSR, Tashkent, Izvestiia, Ser. Fiziko-Matematicheskikh Nauk*, No. 1:47–64, **1958.** 7 figs., 3 tables, 20 refs. Summary in Uzbek, p. 64. **DLC**—The most important theories of frontogenesis and frontolysis developed by KOCHIN, BERGERON, PETTERSSEN, POGOSIAN, TABOROVSKIĬ and MILLER are reviewed, and it is shown that the part played by vertical currents in these processes is very important and that terms containing vertical motion cannot be disregarded in frontogenesis equations. However, the author does not agree with READ and SANDERS who neglect the role of horizontal flow in these processes. An analysis of a distinct frontal zone in the middle troposphere over Central Europe and European U.S.S.R. in the period 6 p.m. Sept. 13, to 6 a.m. Sept. 14, 1954, presented in text, surface and 500 mb charts shows that an indirect solenoidal circulation favoring frontogenesis is observed at the leading edge of the zone, and on the contrary, a direct solenoidal circulation favoring frontolysis is observed in the rear of the frontal zone. Similar results were obtained by other authors. *Subject Headings:* **1. Frontogenesis 2. Vertical motion 3. Frontolysis 4. Central Europe 5. U.S.S.R.**—*A.M.P.*

RADIATION AND TEMPERATURE

RADIATION

See also: **Cosmic ray periodicals** (Saikó), 10.10–45; **Radiation bibliog.,** (Shaw) 10.10–70; **Radioelectric solar radiation** (Débarbat, Pecker), 10.10–88; **Solar radio radiation** (Boischot), 10.10–89; **Solar installations** (Poiarkov), 10.10–115; **Satellite radiation measurement** (Van Allen et al.),10. 10–133; **Ultraviolet radiation** (Grasnick), 10.10–159; **Atmos. pollution effects on radiation** (Sheppard), 10.10–196; **Solar X-ray effects on auroras** (Vegard), 10.10–302; **Radio noise-auroral emission relationships** (Manring, Pettit), 10.10–307.

10.10–245 551.501.721:551.521.1

Hinzpeter, Hans (*Met. und Hydrologischer Dienst der DDR, Potsdam*), **Vergleichende Prüfung von Formeln zur Berechnung von Globalstrahlungssummen.** [Comparative test of formulas for calculating cumulative global radiation values.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, Vienna, 9(1):60–72, **1958.** 3 figs., 20 refs., 23 eqs. English and French summaries p. 60. **DLC**—Different formulas for the calculation of the total radiation of sun and sky on a horizontal surface are critically compared from uniform points of view. The errors to be expected are discussed and examined by applying the formulas for calculations of the long term means of the radiation of sun and sky at Potsdam. *Subject Heading:* **1. Global radiation calculation.**—*Author's abstract.*

10.10–246 551.521.12:551.521.3:551.501.721

Savikovskiĭ, I. A., **Nabliudeniia nad solnechnoĭ radiatsieĭ v svobodnoĭ atmosfere.** [Observations on solar radiation in the free atmosphere.] *Moscow. Tsentral'naia Aerologicheskaia Observatoriia, Trudy*, No. 23:100–108, **1957.** fig., 7 tables. **DLC**—The author evaluates the results of actinometric observations in the free atmosphere carried out near Minsk during August–October 1955. The purpose of these observations was the experimental investigation of the absorption of short wave radiation in different layers of the atmosphere, the variation of short wave radiation flux with height and the albedo of different underlying surfaces. Absorption of radiation and albedo were made during airplane flights with the aid of the Ianishevskiĭ pyranometers, and a compensating galvanometer-potentiometer with constant current. The atmospheric conditions during which flights were made, the characteristics of the airplanes used, the properties of the instruments, the method of observation on absorption and the method of working up the results, including the corrections for averaging the

results, are described. For cloud free days in summer and fall the total radiation in the Minsk district increased with elevation on an average of 0.032 cal/cm²/min in one kilometer. The mean value of the intensity of absorption of radiation in a layer of 0.2–4.0 km amounted to 0.067 cal/cm²/min and the rate of radiational heating was about 0.04 degrees per hour. The radiational heating determined during observation was within the limits of observational error, equal to warming owing to the absorption of radiation by water vapor as computed by the formula of MÖLLER. The following values of albedo were obtained: albedo of a coniferous forest—13.5%; of a leafy (predominantly birch) forest—14%–17%; an inundated meadow—23%; a city—16%. The albedos of a coniferous forest and a city were independent of solar altitude within 15–40°. The variation of albedo with height depends upon the albedo at the earth. The ascending current of radiation increases with height in all instances. *Subject Headings:* **1. Atmospheric absorption measurement 2. Actinometric observation techniques 3. Solar radiation observations 4. Minsk, U.S.S.R.**—*I.L.D.*

10.10–247 551.521.326

Roach, F. E.; Tandberg-Hanssen, E. and Megill, L. R. (*all, Boulder Labs., Natl. Bu. of Standards, Colo.*), **The characteristic size of airglow cells.** *Journal of Atmospheric and Terrestrial Physics*, London, 13(1/2):113–121, Dec. **1958.** 7 figs., 4 tables, 2 refs., 4 eqs. **DLC**—Evidence is presented for the existence of discrete 5577 airglow cells in the upper atmosphere. Independent analyses are based on (a) the comparison of diurnal intensity variations in different parts of the sky and (b) the measurement of intensity gradients on airglow isophote maps. The numerical estimation of cell size is complicated by the fact that a single cell is, in general, larger than the region observable at a given location. The typical airglow cell for the 12 nights of the study has a diameter of approximately 2500 km. *Subject Heading:* **1. Airglow cells.**—*Authors' abstract.*

10.10–248 551.521.326

Roach, F. E.; Tandberg-Hanssen, E. and Megill, L. R. (*all, Boulder Labs., Nat. Bu. of Standards, Col.*), **Movements of airglow cells.** *Journal of Atmospheric and Terrestrial Physics*, London, 13(1/2):122–130, Dec. **1958.** 5 figs., 5 tables, 9 refs. **DLC**—The possibility of translatory and rotatory motions of airglow cells is examined. Evidence is presented for translatory motions in the 100 km region with speeds of the order of 100 m/sec. Rotatory motions are indicated corresponding to a mean period of 5 hr. A broad similarity seems to exist between airglow cell motions in the 100 km region and vortex cells near sea level. The problem of the mechanism responsible for the excitation of the oxygen atom to the S state is discussed with particular reference to (a) photochemical reactions and (b) environmental effects. *Subject Heading:* **1. Airglow cells.**—*Authors' abstract.*

10.10–249 551.521.16:551.593.55

Link František, (*Academy of Sciences, Prague*), **Éclairement crépusculaire en lumière jaune 5893 Å.** [Twilight illumination in the yellow 5893 Å band.] *Studia Geophysica et Geodaetica*, Prague, 2(1):47–53, **1958.** table, 8 refs., 11 eqs. **DWB**—The elements influencing the luminescence of atmospheric sodium (which is produced by the optical resonance of the 5893 Å doublet excited by solar radiation of the same wave length) in twilight are atmospheric absorption due to molecular diffusion, attenuation by refraction as a result of divergence of rays, angular size of the solar disc, absorption by ozone and absorption resulting from diffusion by aerosols in the atmosphere. The influence of diffusion and refraction upon twilight illumination is given respectively by $P=10^{-AM}$ (A = absorption coefficient, M = mass of air traversed by the rays) and

$$t=\frac{1}{H(Hh)\dfrac{dD}{dR\cos}}, \qquad T=pt$$

and the correction for the influence of zero, since at 5893 Å ozone has appreciable absorption, is

$$q=10^{-BO}(h_1h_1) \qquad \text{and} \qquad T=ptq$$

(coefficient of absorption of ozone $= B$). Examples of computations and comparisons with results of computations by other authors indicate the adequacy of the method proposed by the author. A table giving the twilight illumination in yellow light 5893 Å ($A = 0.0038$ km of air, $B = 0.052/\text{cm}O_3$) is presented. *Subject Headings:* **1. Twilight illumination 2. Sodium emission.** —*I.L.D.*

10.10–250 551.521.326

†Jones, A. Vallance and Harrison, A. W. (*both, Univ. of Saskatchewan*), **$'\Delta g^{-3}\Sigma_g$–O_2 Infrared emission band in the twilight airglow spectrum.** *Journal of Atmospheric and Terrestrial Physics*, London, 13(1/2):45–60, Dec. **1958.** 7 figs., 3 tables, bibliog., p. 59–60, 20 eqs. **DLC**—The $0,1'\Delta g^{-3}\Sigma_g$–$O_2$ emission band has been observed at 1.58μ in the evening twilight spectrum obtained with a PbS infrared spectrometer. The band is absent in the morning twilight. The absolute brightness and decay of the emission for a constant zenith distance in the sun-zenith plane has been measured. The measurements have been compared with calculations of the brightness of the bands to be expected as a result of either a resonance phosphorescence excited by infrared solar radiation or by the reaction between atomic oxygen and ozone. A definite decision between these two mechanisms is not yet possible. *Subject Heading:* **1. Twilight infrared spectrum.**—*Authors' abstract.*

10.10–251 551.521.326

†Krasovskiĭ, V. I., **Proiskhozhdenie gidroksil'noĭ sistemy v izluchenii nochnogo neba.** [Origin of the hydroxyl system in the light of the night sky.] *Uspekhi Fizicheskikh Nauk*, Moscow, 63(4):673–691, Dec. **1957.** tables, 39 refs., 30 eqs. **DWB, DLC**—The author reviews the present state of knowledge of the radiation of the night sky, in particular the hydroxyl radiation. The discussion includes the following: the nature of the hydroxyl emission as presented on the basis of the O_3 hypothesis and the O_2 hypothesis; atomic hydrogen in the upper atmosphere, the role of hydroxyl in the emissions of the night sky, the atomic oxygen (OI) 5577 Å emission, the atomic oxygen (OI) 6300 Å emission, the NaI emission, the continuum, and the O_2 emission. *Subject Headings:* **1. Hydroxyl (OH) emissions. 2. Night sky spectrum.**—*I.L.D.*

10.10–252 551.521.326

Kupperian, J. E., Jr.; Byram, E; Chubb, T. A. and Friedman, H., **Extreme ultraviolet radiation in the night sky.** *Annales de Géophysique*, Paris, 14(3):329–333, July/Sept., **1958.** 2 figs., table, 3 refs. **DLC.** Also: similar title in *Planetary and Space Science*, N. Y., London, 1(1):3–6, Jan. **1959.** fig., 5 refs. **DWB.** Also in: *International Geophysical Year, 1957/1958. IGY World Data Center A, IGY Rocket Report Series*, No. 1:186–189, July 30, **1958.** fig., table, 3 refs. **DWB** (M08.362 H237ex)—A directional survey of night sky ultraviolet radiation was made from an Aerobee rocket (NRL-31, 2 200, March 28, 1957) using collimated photon counters and ion chambers sensitive in the 1040 Å to 1350 Å spectral region. Discrete sources of radiation were observed in the 1225 to 1350 Å region which in most cases could be identified with known celestial objects. In contrast a diffuse and quite intense radiation was observed in the 1040 to 1225 Å region. This radiation has been identified by its atmospheric absorption as the Lyman α line of hydrogen. The spatial distribution of this radiation as mapped by the spinning and yawing rocket was obtained for about 50% of both the upper and lower hemispheres. Two features of this distribution are of prime interest. The radiation from above showed a pronounced minimum which was symmetrical about the antisolar direction. Radiation was also observed from the field of view below the rocket. This radiation when viewed from above 120 km was uniformly distributed and was about 42% of the average intensity from above. The results are interpreted as evidence for atomic hydrogen both in the solar system external to the earth's orbit and in the D and E regions of the atmosphere. *Subject Headings:* **1. Ultraviolet night sky radiation 2. Lyman α radiation 3. Atmospheric scattering.** —*Author's abstract.*

10.10–253 535.33:551.521.326

Megrelishvili, T. G., **O liuminestsentsii sumerechnogo neba v infrakrasnoĭ oblasti spektra.** [Twilight sky luminescence in the infrared region of the spectrum.] *Akademiia Nauk SSSR,*

Doklady, 116(5):766–768, **1957.** 7 refs., 4 figs. Transl. into English by E. R. Hope, issued *Canada. Defence Research Board, Translation* 272 R, April **1958.** **DWB**—Earlier studies of the luminescence of the terrestrial atmosphere during twilight covered: (1) the brief flash of the yellow sodium doublet discovered in 1936; (2) the intense emission of the red atomic oxygen line detected in strata higher than 40–70 km (height) during the same year; (3) the twilight emission from N_2 ions and the augmented intensity of the O_2 (λ 8669 Å) and OH (λ 8431, 8780 Å) bands; (4) twilight emission of atomic nitrogen (λ 5200 Å); (5) twilight sky luminescence in the 1μ region during 1955. References to these works are given. In addition there is a discussion on the recent investigation covering the existence of an intense twilight luminescence in the infrared regions of the spectrum, around λ 9400 Å at heights of about 30–40 km and about 90–100 km. The luminosity of the layers can clearly be observed in the area of the sky located on the vertical of the sun at a height of 20° above the horizon, an area where the effect of multiple scattering of light is least prominent. *Subject Headings:* **1. Twilight luminescence spectra 2. Twilight infrared spectrum.**—*N.N.*

10.10–254 551.521.326:551.590.21(234.9)

Rodionov, S. F., **Svetimost' nochnogo neba i solnechnais aktivnost'.** [Brightness of the night sky and solar activity.] (In: Akademiia Nauk SSSR. Komissiia po Issledovaniiu Solntsa, **Fizika solnechnykh korpuskuliarnykh potokov i ikh vozdeĭstvie no verkhniuiu atmosferu zemli.** Moscow, **1957.** p. 269–272. 5 figs.) **DLC** (QB531.A5)—A curve shows the intensity of night sky radiation at 0.9 to 1.1μ during 1949–1952 with respect to solar activity, and other curves show relationships on a day-to-day basis in Sept. and in Dec. 1951 and Jan. and Aug. 1952. Data were obtained on Elbrus expeditions of GEOFIAN, SSSR at 4200 m elev. at 00h, with a zenith angle of 80°. A good positive correlation was obtained between Wolf number and intensity of infrared night sky radiation on a long period (monthly or yearly) basis but not so good results were obtained when correlation was made on a day-to-day basis. In general, it is found that night sky infrared intensity is greatest at times of greatest solar activity. *Subject Headings:* **1. Night sky infrared radiation 2. Night airglow height 3. Solar effects on night airglow 4. Elbrus Expedition, 1949–52 5. Mt. Elbrus, U.S.S.R.**—*M. R.*

10.10–255 551.521.326:546.11

Shklovskiĭ, I. S. (*Acad. of Sciences, U.S.S.R., Moscow*), **On hydrogen emission in the night glow.** *Planetary and Space Science*, N. Y., London, 1(1):63–65, Jan. **1959.** 8 refs., 5 eqs. **DLC**—H_α emission has been observed at the Zvenigorod Station of the Institute for Atmospheric Physics. The width of the observed emission does not exceed the instrumental width of 2 Å. It is shown that the recombination of protons and electrons cannot account for this emission, and that a probable source is the resonance scattering of solar L_α radiation by interplanetary neutral hydrogen atoms. The possibility that L_α radiation arises from a "geocorona" is considered as is the effect of resonance scattering of L_β radiation and the intensity at H_α resulting from fluorescence when L_α and L_β are absorbed. *Subject Headings:* **1. Night airglow emission 2. Hydrogen in upper atmosphere.**—*Author's abstract.*

10.10–256 551.521.67:523.745

Ponomarev, E. A., **Korpuskuliarnoe izluchenie Solntsa i topologiia magnitnogo polia v solnechnoĭ korone.** [Solar corpuscular radiation and the topology of the magnetic field in the solar corona.] (In: Akademiia Nauk SSSR. Komissiia po Issledovaniiu Solntsa, **Fizika solnechnykh korpuskuliarnykh potokov i ikh vozdeĭstvie na verkhniuiu atmosferu zemli.** Moscow, **1957.** p. 69–75. 4 figs., 9 refs., 9 eqs.) **DLC** (QB531.A5)—The shape and rate of diffusion of the solar corpuscular currents or rays in relation to the solar magnetic field are discussed and treated theoretically and empirically on a rough quantitative basis. *Subject Headings:* **1. Corpuscular radiation 2. Solar coronal magnetic field.**—*M.R.*

10.10–257 551.521.67:523.747

Severnyĭ, A. B., **Spektroskopicheskoe issledovanie korpuskuliarnykh vybrosov na Solntse.** [Spectroscopic investigations of corpuscular emissions on the sun.] (In: Akademiia Nauk

SSSR. Komissiia po Issledovaniiu Solntsa, **Fizika solnechnykh korpuskuliarnykh potokov i ikh vozdeĭstvie na verkhniuiu atmosferu zemli.** Moscow, **1957.** p. 40–50. 9 figs., 2 refs., 2 eqs.) **DLC** (QB531.A5)—Equipment for solar corpuscular spectroscopy is described and illustrated and shape of Hα spectral lines from solar faculae discussed and illustrated. *Subject Headings:* **1. Corpuscular radiation 2. Solar faculae spectra.**—*M.R.*

TEMPERATURE

See also: **Frost heaving** (Schmid), 10.10–27; **Temp. changes near the ground** (Deguillaume), 10.10–126; **Vertical thermal gradient** (Gião, Roulleau), 10.10–129; **Upper air temp. analysis** (Gel'mgol'ts), 10.10–134; **Upper air temp. analysis** (Nakorenko), 10.10–135; **Temp. data, Norway,** 10.10–143; **Temp. profile instrumentation** (Lettau), 10.10–160; **Mast instrumentation for temp. meas.** (Stewart), 10.10–161; **Rime formation, Tatar A.S.S.R.** (Persova), 10.10–178; **Min. temp. forecasting** (Lamp), 10.10–180; **Frost forecasting, Byelorussia** (Medzhitov), 10.10–181; **Turbulent heat flux measurement** (Gaĭgerov, Kastrov), 10.10–268; **Long range temp. forecasting** (Křivský), 10.10–294.

10.10–258 551.524.32:551.588.2(47,57)

Kvaratskheliia, I. F., **Osobennosti izmeneniia s vysotoĭ godovoĭ amplitudy temperatury vozdukha nad iuzhnymi raĭonami SSSR.** [Characteristics of the variation of the annual range of atmospheric temperature with height over the southern regions of the U.S.S.R.] *Meteorologiia i Gidrologiia*, Leningrad, No. 4:21–23, April **1958.** fig., 2 tables. **DWB, DLC**—An examination of the variation with height of the annual temperature amplitude over various localities in the southern U.S.S.R. situated at approximately the same latitudes, but in different climatic zones, showed a variation of 17.9°C at Sukhumi and 25.9°C at Tashkent at the earth's surface. The influence of general climatic conditions (subtropicality or continentality) is manifested only in the lower kilometers of the atmosphere. Beginning with 4 kilometers the amplitudes are very close for the various localities. They also decline at lower altitudes but at 10 km they attain maximum values (23° to 25°C), decline sharply above this height, and at 15 km they reach 7° to 9°C. The effect of the earth's surface upon amplitudes at lower levels, and of air masses upon amplitudes at higher altitudes, and the monthly variation of temperature amplitudes in the free atmosphere are discussed. Data are presented on the temperature differences of adjacent months at different altitudes for Tiflis and on the annual amplitudes of temperature at various altitudes for Sukhumi, Tiflis, Baku and Tashkent. *Subject Headings:* **1. Temperature amplitude variations with height 2. Annual temperature variations 3. Southern U.S.S.R.**—*I.L.D.*

10.10–259 551.524.3(43)

*Gutsche, Anneliese, **Zur interdiurnen Veränderung der Temperatur über Berlin.** [Interdiurnal temperature changes over Berlin.] *Meteorologische Rundschau*, Berlin, 10(6):186–189, Nov./Dec. **1958.** fig., 3 tables, 6 refs. **DWB, DLC**—Atmospheric temperatures were measured four times daily by means of radiosondes (0300, 1900, 1500 and 2100 hours GMT) at 1, 1.5, 3.5, 7 and 9 km and 24 hour temperature variations were computed for these elevations and also for ground level and the means and frequency distribution of the interdiurnal temperatures for these elevations for the months of January and July, and for the year as a whole, are analyzed. Data on the monthly means of interdiurnal temperature changes, frequency distribution of the interdiurnal temperature changes over Berlin for the above specified levels and times for 1949, 1951–53, frequency distribution of the interdiurnal temperatures in January and July, and the mean annual relative frequency of interdiurnal temperature changes at the ground and 5 km are presented. For all fixed time intervals January and July differ considerably in the variation of frequency distribution with elevation. In the case of January there is an increased scattering with height up to the 5 km level, above this the scattering declines but at 9 km it is still greater than at the ground. In July the distribution is much more uniform. The scattering of interdiurnal temperature relative to the ground, as illustrated by January, holds also for mean annual distribution. *Subject Headings:* **1. Interdiurnal temperature variations 2. Temperature distribution 3. Berlin, Germany.**—*I.L.D.*

10.10–260 551.524.31(510) 551.543.1 551.524.73

*Yang, Chien-chu (*Inst. of Geophysics and Met., Academia Sinica*), **A study of the mea interdiurnal pressure and temperature variability over China.** *Acta Meteorologica Sinic* Peking, 29(3):201–212, Aug. **1958.** 4 figs., 8 tables, 12 refs. In Chinese; English summar p. 212. **DLC**—In this paper the recent surface observations (1951–1955) and radiosond data (1953–1955) of China were used to calculate the mean monthly interdiurnal pressure an temperature variability at surface, and the mean interdiurnal variability of altitude an temperature at certain standard pressure levels (700, 500 and 300 mb). From these resul the seasonal characteristics of weather and climate over China are discussed. Finally, th influence of the Tibetan plateau on the variability is discussed. *Subject Headings:* **1. Inte diurnal pressure variations 2. Interdiurnal temperature variations 3. Interdiurnal upper a temperature variations 4. China.**—*Author's abstract.*

10.10–261 551.524.32(474.

*Kaushila, K. A., **Nekotorye osobennosti v godovom khode temperatury vozdukha termicheskie sezony.** [Some peculiarities of annual change of the temperature and th problem of thermal seasons.] *Lietuvos TSR Mokslų Akademija. Geologijos ir Geografij Institutas, Mokslinia Pranešimai*, 5:129–135, **1957.** 3 figs. **DWB**—Yearly graphs of dail average and extreme temperatures at Vilnius are analyzed for the period of forty years. A attempt is made to explain the discontinuities and anomalies in the annual curves of tem perature by some peculiarities of circulation. *Subject Headings:* **1. Annual temperature varia tions 2. Long period temperature records 3. Extreme temperatures 4. Vilnius, Lithuani** —*A.M.P.*

10.10–262 551.524.35(78

Kibler, Clarence L. and Rogers, Marvin R. (*both, Natl. Wea. Analysis Center, U. S. W. B Wash., D. C.*), **Anomalous temperatures over the Rocky Mountain States, Oct. 18–22, 195** *Monthly Weather Review*, Wash., D. C., 86(10):416–422, Oct. **1958.** 13 figs., table, 5 ref **DWB, DLC**—The weather feature discussed in this article is a reversal of the monthly norma temperature pattern that occurred during the period Oct. 18–22, 1958. This brief period o low temperatures over the Rocky Mountain States was emphasized because it closely followe maximum temperatures of 80's and 90's near the Canadian Border. "A high of 97° wa reported at Wagner, South Dakota, on the 15th. . . . Los Angeles recorded 104° on the 16t equaling the previous record high there for October." These abnormally high temperature were quickly eliminated as a rapidly developing cyclone system brought cold air into th Pacific Northwest on the 18th and 19th. Otherwise, October 1958 weather was generall uneventful with the Western States somewhat warmer and drier than normal while the easter areas tended to be slightly cooler than normal. A complete discussion of these general feature is given by ANDREWS elsewhere in this issue. *Subject Headings:* **1. Temperature anomalie 2. Temperature extremes 3. Rocky Mountain States..**—*Authors' introduction.*

10.10–263 551.510.528:551.524.7(21

Portig, Wilfried, **Temperaturschwankungen der freien Atmosphäre in den Tropen.** [Tem perature variations of the free atmosphere in the tropics.] *Annalen der Meteorologie*, Hamburg 8(3/4):125–127, **1957. DWB, DLC**—In the tropics the tropopause is considerably higher tha outside of them, the very low temperatures needed to equalize the high temperatures of th lower layers are reached at 16–18 km. The temperature oscillations in the tropics are sligh at high altitudes as well as on the ground. Tables taken from U. S. daily weather maps sho the mean temperatures and their scattering and extreme values for April 1956, at Balboa Panama and Guantánamo, Cuba, for levels from 500 to 150 mb. Errors in measurement an not much smaller than the variations. The frequency of 24 hour temperature variation between 500 and 150 mb in April 1956 are presented. For Balboa and Guantánamo the mea deviations are: $d = \pm 0.96°C$, $\sigma = \pm 1.27°C$ and $d = \pm 1.02$, $\sigma = \pm 1.43$, respectively. The lowes temperature in Balboa was always at the 100 mb level (or at 16,500 m) and at Guantánam at 80 or 100 mb (occasionally up to 18,000 m). *Subject Headings:* **1. Upper air temperatur variations 2. Tropical tropopause 3. Balboa, Panama 4. Guantánamo, Cuba.**—*I.L.D.*

10.10–264 551.524.731(473):551.508.2

*Kastrov, V. G., **O sutochnom khode temperatury v nizhneĭ chasti troposfery.** [Daily temperature variations in the lower troposphere.] *Moscow. Tsentral'naia Aerologicheskaia Observatoriia, Trudy*, No. 23:78–99, **1957.** 2 figs., 8 tables, 14 refs., 32 eqs. **DLC**—A brief review of the literature on the daily variations of atmospheric temperatures in the lower troposphere (up to 5 km), measured by means of radiosondes, showed that the daily amplitude was around 2–3°C. In order to eliminate the radiational errors in radiosondes, the author employed aircraft sounding for determining the daily amplitude of air temperature in the lower troposphere. Simultaneous temperature measurements with the P3-049 radiosonde and with aircraft sounding showed that the error of this radiosonde at midday, during the summer near Moscow, amounted to 1–1.5°C on a clear day and it exceeded 2.5°C during cloud cover. The amplitude of the daily temperature at altitudes of 2–5 km was 0.6°C for the average of all summer days near Moscow, but 1.0°C for clear days. The maximum temperature occurred at 15–19 hours. The daily variation of temperature in the lower 2–3 km is determined chiefly by the transport of heat from the underlying surface and by the absorption of heat of solar radiation. Theoretical amplitudes of daily variations of temperature at these layers are considerably smaller than observed values. A theory of the diurnal variation of temperature in the troposphere is developed by solving the problem of daily temperature variation by a method taking into account selective absorption of radiation in the atmosphere. *Subject Headings:* **1. Diurnal tropospheric temperature variations 2. Aircraft-radiosonde temperature comparisons 3. Radiosonde errors 4. Moscow, U.S.S.R.**—*I.L.D.*

SOIL TEMPERATURE

See: **Ground temp.** (Chang), 10.10–25; **Soil freezing** (Schmid), 10.10–27.

WATER TEMPERATURE

See: **Water temp. measurement** (Benditskiĭ), 10.10–71; **Water temp. measurement** (Kontoboĭtseva, 10.10–72.

PRESSURE AND WIND

PRESSURE

See also: **Tides** (Defant), 10.10–33; **Gradient wind protractors** (Lamp), 10.10–137; **Barotropic vorticity eqs.** (Huber-Pock), 10.10–172; **Aircraft obs. of surface pressure in tropical cyclone** (Jordan), 10.10–173; **Pressure forecasting** (Brandejs, Zikmunda), 10.10–175; **Pressure forecasting** (Belov), 10.10–182; **Energy exchange sea-atmos.** (Manabe), 10.10–222; **Long period oscillations, Pacific** (Berlage), 10.10–233; **Pressure and temp. variations, China** (Yang), 10.10–260.

10.10–265 551.542:551.511:551.551

Mkhitarian, A. M., **Uchet prizemnogo treniia v zadache o raspredelenii davleniia na urovne moria.** [Calculating surface friction in connection with the problem of sea level pressure distribution.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 1:80–83, **1955.** 2 refs., 9 eqs. **DLC**—A theory is advanced for sea level pressure distribution calculated from surface friction (vertical turbulent exchange). The problem is treated by means of a linear theory and its solution is presented in the form of series arranged according to spherical functions. *Subject Headings:* **1. Sea level pressure distribution calculation 2. Vertical turbulent exchange.**—*Author's abstract.*

10.10–266 551.543:525.6:523.746

Haurwitz, B.; London, J.; Sepulveda, G. M. and Siebert, M., **Solar activity and atmospheric tides.** *Journal of Geophysical Research*, Wash., D. C., 62(3):489–491, Sept. **1957.** 3 figs., 3 refs. **DLC**—A study of the solar (S_2) and lunar (L_2) semidiurnal atmospheric tides at Batavia for 80 years (1866–1945) and Manila for 49 years (1890–1938), correlated with Zurich

relative sunspot numbers shows a remarkable lack of correlation between amplitude of sola or lunar tides and sunspot number. Even in a case where graphical presentation reveals a apparently good lag correlation of 3 years, a statistical test shows only + 0.036±.11 or n correlation. Also if 3 years out of 80 are removed from Batavia data even the 11 year cycl seems to drop out of the picture. *Subject Headings:* **1. Atmospheric tides 2. Solar-weathe relationships 3. Sunspot influences on atmospheric tides.**—*M.R.*

10.10–267 551.543.

Kertz, W., **Partialwellen in den halb- und vierteltäglichen gezeitenartigen Schwingunge der Atmosphäre.** [Partial waves in half and quarter-daily atmospheric tide-like oscillations. *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, Vienna, 11(1):48–63, 1959 3 figs., 6 tables, 15 refs., 3 eqs. English and French summaries p. 48–49. **DWB, DLC**—Th patterns of the possible component waves in atmospheric tides are described. An analysi of the geographical distribution of the semidiurnal pressure oscillation into these componen waves shows that there is a third wave (S_{23}^3) with appreciable amplitude besides the we known migrating (S_{22}^2) and standing (S_{22}^0) waves. It consists of three high and three lo pressure areas moving around the earth in 3/2 days. Comparisons between correspondin component waves in pressure and temperature lead to the establishment of an empirica reasonance curve for the thermal excitation. Similar analysis has been made for the loca time waves in the six-hourly pressure oscillations and their seasonal variations. *Subje Headings:* **1. Atmospheric oscillations 2. Semidiurnal pressure oscillations.**—*Author' abstract.*

WIND

See: **Wind components** (Lettau), 10.10–124; **Wind analysis** (Nakorenko), 10.10–138.

GUSTINESS AND TURBULENCE

See also: **Turbulent transfer** (Priestley), 10.10–11; **Turbulent diffusion** (Priestley et al.), 10.10–22; **High level turbulence effects on flying** (Pchelko), 10.10–101; **Airplane response to turbulence** (Tobak), 10.10–103; **Radar turbulence measurement** (Gorelik et al.), 10.10–140; **Turbulence effects on air pollution** (Neuwirth), 10.10–195; **Eddy transfer theories** (Belousov), 10.10–221; **Calculating pressure distribution from turbulent exchange** (Mkhitarian), 10.10–265.

10.10–268 551.551:551.510.52:551.524:551.50

*Gaĭgerov, S. S. and Kastrov, V. G., **Opyt izmereniia vertikal'nogo turbulentnogo potok tepla v nizhneĭ chasti troposfery.** [Attempt at measuring the vertical turbulent heat curren in the lower part of the troposphere.] *Moscow. Tsentral'naia Aerologicheskaia Observatoriia Trudy*, No. 23:16–51, **1957.** 13 figs., 10 tables, plus tables in appendix, 11 refs., eqs. **DLC**— The equation for measuring turbulent heat flux in unit of time developed by A. M. Obukho is $p_0' = C_p\bar{\rho}\ \overline{\delta T_i w_i}$ or $p_0' = 60\ c_p\bar{\rho}\ \overline{\delta T_i w_i}$, if all the magnitudes in the right half are expressed i the CGS system and p' in cal/cm² min. The pulsations of temperature were recorded b means of a microthermograph. Vertical velocity was measured by means of a vane anemomete with a statoscope, adapted for distance recording. All measurements were made from balloon in free flight. The temperature elements, the accuracy of the measuring elements and th galvanometer sensitivity are described. The contents of this study include the following sources of error arising during recording of temperature pulsations as a result of heating of th wires by the measuring current and heating of the elements by solar radiation; the inertia o the vertical anemometer and resulting errors in the temperature pulsations; influence of hori zontal wind; results of observations with the microthermograph and anemometer; method o computing turbulent heat flow; and the results of computations. The synchronous recordin of temperature pulsations and vertical movements from free balloons over European U.S.S.R at heights of 0.2 to 2 km during slightly cloudy summer days leads to the following conclusions micropulsations of temperature with a period of 2–3 sec. usually do not exceed 0.1°C but some times attain 0.5°C. By day they represent a brief rise in temperature produced by rising warm air bubbles. Frequently micropulsations are entirely absent. Temperature pulsations with

eriods of the order of 12 sec usually exceed 0.05° by day and sometimes attain 0.1°C, but night they are most frequently less than 0.05°C. A vertical heat current transported by urbulent structures of 1 to several tens of meters usually varies by thousands cal/cm² min. n the lower 500 m and near clouds the flow attained by day was 0.005°–0.010 cal/cm² min nd was directed upward, although the vertical temperature gradient did not reach an adiabatic alue. An appendix contains detailed descriptions of the balloon flights and the observational ata presented in tables. *Subject Heading:* **1. Turbulent heat flux measurement techniques.** —*I.L.D.*

10.10–269 551.551:551.554

*Lettau, Heinz H., **Computation of Richardson numbers, classification of wind profiles, nd determination of roughness parameters.** (In: Lettau, H. H. and Davidson, Ben. *(eds.)*, **Exploring the atmosphere's first mile.** N. Y., Pergamon Press, **1957.** Vol. 1:328–336. ables, 5 refs., 13 eqs.) **DWB**—The contents of this paper are as follows: definition of "local" nd Richardson number; computation of local Richardson numbers; classification of runs ccording to convective stability; class averages of wind profiles and determination of roughness arameters. Extensive numerical data are presented in tables. *Subject Headings:* **1. Richard- on's number 2. Wind profiles 3. Roughness parameters.**—*I.L.D.*

10.10–270 551.551:533.16

Lettau, Heinz H., **Summary of non-dimensional characteristics of boundary layer theory.** In: Lettau, H. H. and Davidson, Ben. *(eds.)*, **Exploring the atmosphere's first mile.** N. Y., Pergamon Press, **1957.** Vol. 1:337–372. 9 figs., 14 tables, 15 refs., 45 eqs.) **DWB**—The author attempts "to summarize some of the experimental results of the Great Plains Turbulence Field Program in a nondimensional form." The methods and results of computations are presented for the following: logarithmic height deviations of wind speed, shear, and shearing stress as a function of convective stability; nondimensional parameters from mean profile data in the surface layer; diffusivity and velocity ratios, drag coefficients and Kármán numbers; the Reynolds, Rayleigh, Froude and Richardson models; comparison of boundary layer characteristics in atmospheric and wind tunnel flow; nondimensional parameters from fluctuation data, and power spectra and energy dissipation parameters. *Subject Headings:* **1. Bound- ary layer theories 2. Atmospheric turbulence.**—*I.L.D.*

10.10–271 551.551:551.510.53

†Matveev, L. T., **Kolichestvennye kharakteristiki turbulentnogo obmena v verkhneĭ troposfere i nizhneĭ stratosfere.** [Quantitative characteristics of turbulent exchange in the upper troposphere and lower stratosphere.] *Akademiia Nauk S.S.S.R., Izvestiia, Ser. Geofiz.*, No. 7:927–931, **1958.** fig., 3 tables, 22 refs., 18 eqs. **DLC.** English transl. in the **Izvestiia,** *Bulletin of the Academy of Sciences of the U.S.S.R., Geophysics Series*, No. 7:531–533, **1958,** issued 1959 by American Geophysical Union. The author shows that the coefficient of turbulent exchange k in the upper atmosphere is computed by the formula $k = \frac{(G/S)\tau}{\rho C^{\alpha}y} \overline{\Delta}_n$, where $\overline{\Delta}_n$ = mean (for a given horizontal area) absolute value of the vertical load of an airplane; G/S = specific load of the load bearing surface of an airplane; $C^{\alpha}y$ = coefficient characterizing the lifting force of the airplane as a function of angle of attack; ρ = atmospheric density at height of the airplane. From the data on the airplane load given by the oscillograph record it is possible to calculate k. In this paper a relationship is established between the coefficient of turbulent exchange and the fundamental physical parameters upon which thermodynamic stability and turbulent mixing of the atmosphere depend. From temperature-wind sounding of the atmosphere, vertical temperature gradients and wind velocity, the Richardson number and wind velocity (u) at airplane height were computed. From the relationship established the formula for computing the coefficient of turbulent exchange is developed, namely

$$\frac{k^{\beta}}{u^2} = 10^{-4}(17.92 - 11.57 \lg R_i)$$

Finally, $k = (u^2/\beta)[2.314 \lg \beta - 1.157 \lg (\gamma_a - \gamma) - 0.072]$ where β = vertical gradient of wind

velocity m/sec km; γ = degrees/km. By means of $\overline{\Delta}_n = 4.10^{-2}(u/b)\sqrt{17.92 - 11.57 \lg R_i}$, where $b = \frac{2(G/S)}{\rho v C^{\alpha} y}$, it is possible to compute the load of the airplane from atmospheric sounding. *Subject Headings:* **1. Turbulent exchange 2. Upper air turbulence 3. Turbulence in the stratosphere.**—*I.L.D.*

10.10–272 551.551.

†Monin, A. S., **Struktura atmosfernoĭ turbulentnosti.** [Structure of atmospheric turbulence.] *Teoriia Veroiatnosteĭ i ee Primeneniia*, Moscow, 3(3):285–317, **1958.** 9 figs., 8 refs., 72 eqs. English summary p. 317. **DWB**—Theoretical and experimental data are given for the statistical characteristics of random fields of wind velocity and turbulent fluctuations of temperature in the lowest layer of the atmosphere. Fluctuations are considered at one and two space time points. Probability distributions, moments, autocorrelation and structure functions, spectra and cross-spectra are studied. Some dimensionless characteristics (universal functions) are determined by means of KOLMOGOROV's similarity theory for small eddies and similarity theory for fully developed turbulence proposed by OBUKHOV and MONIN. In addition a short summary is given of works on pressure fluctuations, turbulent accelerations, turbulent diffusion and also on the problem of "fluctuations and waves." *Subject Headings:* **1. Turbulence structure 2. Turbulent temperature fluctuations 3. Kolmogorov's similarity hypothesis.**—*Author's abstract.*

10.10–273 551.551.2

Kazanskiĭ, A. B., and Monin, A. S., **O turbulentnom rezhime v prizemnom sloe vozdukha pri neustoĭchivoĭ stratifikatsii.** [The turbulent regime in the air layer near the ground with unstable stratification.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 6:741–751, **1958.** 6 figs., 15 refs., 28 eqs. **DLC.** English transl. in the **Izvestiia,** *Bulletin of the Academy of Sciences of the USSR, Geophysics Series*, No. 6, June **1958,** issued 1959 by the American Geophysical Union.—On the basis of the theory of similarity for the turbulence regime in the layer near the ground and experimental data, the fact is established that in the case of non-stable stratifications outside of a thin sub-layer of dynamic turbulence, the mechanism of atmospheric mixing hardly differs from the mechanism of free convection. Formula and nomograms are presented for determining the characteristics of turbulence on the basis of data of gradient measurements. *Subject Headings:* **1. Low level turbulence 2. Turbulence theory** —*Transl. of authors' summary.*

HORIZONTAL DISTRIBUTION AND WIND VARIATIONS

10.10–274 551.552

§Bulinskaia, N. A., **O formirovanii polia vetra.** [The formation of the wind field.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 11:1406–1417, Nov. **1958.** 13 figs., 12 refs., eq **DLC**—Over land and sea regions, distant from the coasts, the components of standing thermobaric waves in the atmosphere play a fundamental role in the formation of strong winds. In regions situated close to coasts the monsoon component of the atmospheric circulation is the fundamental factor of the atmospheric circulation determining the origin of strong winds. Bora winds, or monsoon winds, are special cases of the strong influence of the monsoon component upon the origin of the direction and velocity of the wind in coastal regions. At the beginning of the natural season it is possible to show regions of frequent wind intensification for land and sea areas distant from the coast line and for land and sea areas of coastal regions. These relationships were derived by computing for eleven seasons (selected by a method described by the author) the prevailing wind direction with a velocity 10 m/sec and greater, the number of days with wind velocities of 10 m/sec and greater, and maximum wind velocity in a season. Synoptic charts and relevant aerological cross sections are presented. *Subject Heading:* **1. Wind field formation.**—*I.L.D.*

10.10–275 551.552:551.43(235.24)

Karbatkin, G. P. **Vliianie krupnykh orograficheskikh prepiatstvii na zapadno-vostochnyĭ otok.** [Influence of large orographic obstacles on the westerlies.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 2:244–254, Feb. **1958.** 10 figs., 11 refs., 23 eqs. **DLC.** English transl. by David Kraus, issued by American Meteorological Society under Contract AF 19(604)-1936, June 1958. 18 script p.—The author proposes a method for solving the effect of orographic obstacles upon westerlies, taking into account the flow of air around mountains with special reference to the atmospheric circulation of the Himalayas and Tibet. In this solution the zonal current is set as a function of latitude. For a stationary linear barotropic model, the initial equations for the vertical component of eddy velocity and discontinuity are solved for a mean level and for the limiting conditions for which $z=\xi'(\theta,\lambda)$ and $z=\infty$. The resulting equations are linearized for the above limiting conditions and an equation for $\phi'(\theta,\lambda)$ is derived and solved. The zonal velocity for summer and winter is computed for the Tibet and Himalayan region and the circulation characteristics of this region are analyzed on the basis of observational data and compared with theoretically calculated results. *Subject Headings:* 1. **Air flow around mountains** 2. **Orographic effects on westerlies** 3. **Tibet** 4. **Himalayan Region.**—*I.L.D.*

SPECIAL WINDS AND WIND EFFECTS

See: **Titov's wind wave formulas** (Brovikov, Krylov), 10.10–77; **Wind driven currents, Atlantic** (Sarkisian), 10.10–80, **Föhn met.** (Undt), 10.10–119; **Water surface influences on sukhoveĭ** (Vul'fson, Pavlova), 10.10–280.

UPPER AIR WINDS

See also: **Upper air climat., U. S.** (Ratner), 10.10–23; **Upper air winds** (Hudson et al.), 10.10–25; **Met. conditions for high level flying** (Pchelko), 10.10–101; **Jet stream studies** (Dzhordzhio), 10.10–127; **Gradient wind protractors** (Lamp), 10.10–137; **Wind velocities, N. Pacific** (Angell), 10.10–151; **High level wind soundings,** 10.10–152; **Seasonal stratospheric wind variation** (Barbé), 10.10–199; **Arctic jet stream** (Campbell), 10.10–230; **Jet stream-forest fire relationships** (Schaefer), 10.10–232; **Frontal zones and jet streams, E. Asia, N. Europe** (Pogosian), 10.10–242.

10.10–276 551.557:531.56

Roth-Desmeules, Ernest and Sänger, Raymund. **Über den Einfluss eines mit der Höhe veränderlichen Windes auf die Flugbahn einer Rakete.** [Influence of wind on the trajectory of a rocket, when the wind varies in terms of altitude.] *Zeitschrift für angewandte Mathematik und Physik*, Basel, 9b, 5/6:528–542, **1958. DLC.**—The effect of wind, which is variable in terms of altitude, on the active and passive trajectory of an artillery rocket has been calculated under certain simplified conditions. It is shown that the wind can be replaced by a "ballistic wind," independent of altitude, but which is not the same for the longitudinal and transversal components of movement. The ballistic wind is obtained by giving a definite weight to winds from different atmospheric layers. *Subject Headings:* 1. **Upper air wind influence on artillery rockets** 2. **Ballistic wind.**—*A.V.*

10.10–277 551.557.31:551.510.535(851)

++Vestine, E. H. (*Rand Corp., Santa Monica, Calif.*). **Seasonal changes in day-to-day variability of upper air winds near the 100-km level of the atmosphere. *American Geophysical Union, Transactions*, 39, 2:213–223, April **1958.** 8 figs., 7 tables, 40 refs. **DWB, DLC.**—Diurnal changes in *Sq* are probably brought about by some day-to-day changes in wind speeds since changes in *Sq*-amplitude correspond inversely to changes in foF2. Daily distortions of the existing zonal wind patterns may probably induce the dynamo electric field responsible for the diurnal variations. This electric field may lift or lower the E region slightly, thus affecting the integrated effective conductivity of the region carrying *Sq* currents. The day-to-day differences in wind speeds near the E region, as at Huancayo, Peru, are greatest in

northern winter and least in northern summer. The effects of the sunspot and other change related to the evidences of variability dependent on season as noted from meteorology fo tropospheric winds are herein discussed. *Subject Headings:* **1. Diurnal-upper air wind varia tions 2. Ionospheric winds 3. Huancayo, Peru.**—*N.N.*

10.10–278 551.557.35:551.513:523.74

Trenkle, H., **Die zonale Windkomponente im Atlantisch-Europäischen Sektor in Ab hängigkeit von kurzperiodischen Schwankungen der Sonnenaktivität, Pt. 2, Erweitert Untersuchung.** [The zonal wind-component in the Atlantic-European sector and its de pendence on short period variations of solar activity, Pt. 2, Further investigations.] *Me teorologische Rundschau*, Berlin, 10(6):177–179, Nov./Dec. **1957.** 2 figs., 3 tables, 7 ref **DWB, DLC**—In Pt. 1 (*see* 8.7–248, July 1957, *MAB*), the author showed that zonal component of the geostrophic wind at 500 mb (Ug120) in the Atlantic-European sector (60°W–60°E between 50° and 60°N show characteristic oscillations in the three weeks following isolate sunspot maxima (R_{max}) which were preceded by a relatively brief ($\leq$10 days) but intense ris in sunspot relative numbers (R) of $\leq$40 units. In Pt. 2, 140 cases of solar R_{max} extendin over an interval of 9½ years of which 69 corresponded to low index situations and 71 to high index situations (R_{max} with $\Delta R_{min\text{-}max} \leq +40$ E in $\leq$10 days) are considered. In the cases o low index with subnormal Ug120 on the test day, Ug120 increases from the 5th to the 8th da following by 5.1–5.3 m/sec, that is 94–100% of the absolute magnitude of Ug120 on the test day in the case of high index with above normal Ug120 on the test day, Ug 120 on the average de creases irregularly up to the twentieth day by 7.7 m/sec. *Subject Headings:* **1. Zonal wind components 2. Upper air wind variations 3. Sunspot effects.**—*I.L.D.*

10.10–279 551.557.32(99

*Leonov, N. G., **Nekotorye osobennosti izmeneniia vetra s vysotoĭ nad vostochnym po berezh'em Antarktidy.** [Some characteristics of wind variations with height over the eastern coast of Antarctica.] *Meteorologiia i Gidrologiia*, Leningrad, No. 6:8–13, June **1958.** 2 tables **DWB, DLC**—A study of the seasonal circulation in Antarctica based upon wind observations at the surface and in the free atmosphere to a height of 18 km made at Mawson and Mirny during March 1956–February 1957. The wind observations according to season, height and locality and the frequency of westerly and easterly wind components at different heights and during different months are presented in tables. Along the eastern coast of Antarctica an eastern wind component predominates in the lower layers to 1.5 km. With increasing height the frequency of the eastern wind component diminishes and that of the western component increases. The transition from an anticyclonic to a cyclonic circulation aloft has the following seasonal characteristics: During fall the transition from an eastern to western component occurs at lower levels than during the other seasons, i.e., over eastern Antarctica the anti-cyclone is more poorly developed vertically in the fall than in other seasons. In summer the eastern wind component is conserved at all levels along the eastern coast of Antarctica in no less than 30% of the cases; the frequency of the eastern component begins to increase at 12 km. Winter and spring differ little from one another and occupy an intermediate situation between fall and summer. November, the last fall month is an exception. The transition from summer type circulation at high altitude to fall type is very abrupt. During the entire year regions of high pressure are encountered in the entire troposphere. During the entire year, except summer, the Antarctic anticyclone was more poorly developed vertically over the Mawson than over the Mirny region. The activity of the zone layer in summer in the Mawson regio was expressed less strongly than in Mirny. *Subject Headings:* **1. Wind variations with height 2. Seasonal wind components in Antarctica 3. Antarctica.**—*I.L.D.*

VERTICAL MOTION

See: **Bubble theory of cloud formation** (Dessens), **10.10–183.**

AQUEOUS VAPOR, HYDROMETEORS AND HYDROMETEOROLOGY

HUMIDITY

10.10–280 551.571:551.556.8:551.461.2

Vul'fson, N. I. and Pavlova, I. S. **K voprosu o vlianii vodnykh poverkhnostei na vlazhnost' vozdukha.** [Influence of water surfaces on atmospheric moisture.] In: Akademiia Nauk SSSR. Institut Geografii. **Sukhovei ikh proiskhozhdenie i bor'ba s nimi.** Moscow, 1957. 267–274. 4 figs., 1 tables. DLC QC940.P946 —Fifteen special airplane flights were carried out in Kuybyshev and Golodnaya Steppe in 1952 and 1953, over water and land surfaces. Measurements of air temperature and humidity were made in connection with a study of convection in the atmosphere, in order to investigate the indirect effect of important irrigation systems, water reservoirs and ponds on the quantity of moisture in the atmosphere, and the use of the area involved. The methods and results are presented in graphs and tables, and discussed. It is shown that the influence of water and moistened underlying surfaces affects not only the lower air layers, but the whole convective layer, and expands to a considerable distance from the moistened region, and thus reduces the injurious effects of dry winds on vegetation. *Subject Headings:* 1. **Water surface effects on humidity** 2. **Humidity profiles over water surfaces** 3. **Golodnaya Steppe, U.S.S.R.** —*A.M.P.*

10.10–281 551.571.1:551.577.32 '470

Grigor'eva, A. S. **Vlagooborot na iuge Evropeiskoi territorii SSSR v kholodnyi period 1950/51 g.** [Moisture balance in the southern part of European U.S.S.R. during the cold period of 1950/51.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia. Trudy*, No. 62 (124): 44–51. 1956. 6 figs., 6 tables, 4 refs. DLC—This study of the moisture balance was carried out on the basis of surface and upper air charts as well as aerological observational data (partly) for the winter 1950/1951, which was rather poor in snow. The period from November to March was divided into separate synoptic periods and the provenance and moisture content of air masses upon their arrival into the territory was determined by constructing air trajectories for the precipitation-forming air masses. It was found that conditions for precipitation were most favorable in March and in November–January. At all other time circulation conditions were unfavorable. This explains why the winter's precipitation amount was considerably below the mean for a long period. *Subject Headings:* 1. **Moisture balance during winter** 2. **Winter precipitation anomalies** 3. **U.S.S.R.**—*A.M.P.*

10.10–282 551.571.7(47)

*Polovina, I. P. **Tochnost' aerokliматicheskikh kharakteristik udel'noi vlazhnosti.** [Accuracy of aeroclimatic characteristics of specific humidity.] *Leningrad. Nauchno-Issledovatel'skii Institut Aerklimatologii. Trudy*, No. 3:74–81. 1957. 10 tables, 3 eqs. DWB—Monthly specific humidity data from 5 stations in the U.S.S.R., Murmansk, Kharkov, Smolensk, Kuybyshev and Saratov, for 10 yrs for surface, 1, 3 and 5 km are analyzed to show: 1. the total number and percent of observations each month reaching the 1, 3 and 5 km levels, 2. the errors in mean specific humidity for each level and month, and 3. the mean error in the normal mean monthly specific humidity and the relative errors in same. Finally, the accuracy for a particular year and the number of observations needed for computing the specific humidity to given accuracy are discussed and tabulated. *Subject Headings:* 1. **Upper air humidity data** 2. **Specific humidity over U.S.S.R.** 3. **European U.S.S.R.**—*M.P.*

EVAPORATION AND EVAPOTRANSPIRATION

10.10–30 **Evap. of drops** Fuks 10.10–30 **Water balance maps, S.W. Asia** (Thornthwaite et al.) 10.10–32: bibliog. on **Evapotranspiration**, p. 1552.

CONDENSATION

See also: **Aerosols** (Avy), 10.10–14; **Drop growth** (Fuks), 10.10–30; **Aerosols** (Volz), 10.10–37; **Atmos. chem.** (Oddie), 10.10–188.

10.10–283 551.574.11:546.1

†Bulinskaia, N. A. and Zhavoronkina, T. K., **O proiskhozhdenii soleĭ v atmosfere.** [Origi of salts in the atmosphere.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 8:1006–1014 **1958.** 7 figs., 2 tables, 18 refs., foot-refs. **DLC.** English transl. in the **Izvestiia,** *Bulletin the Academy of Sciences of the USSR, Geophysics Series,* No. 8:578–582, Aug. **1958,** issued 195 by the American Geophysical Union.—The role of monsoon components of circulation i the transport of sea salt onto continents is examined. Atmospheric salt samples were co lected at 24 stations situated along meridian 33°E and lat. 52–54°N. The concentratio of Cl was determined by means of a spectrograph. The most suitable chlorine lines wer $\lambda=4819.5$ and $\lambda=4794.5$ Å. The amount of chlorine in mg/liter obtained by analyzin atmospheric precipitation during different types of atmospheric circulation was plotted on map and compared with air mass transport for a given day. Evidence is presented showin that the monsoon circulation is a very important constituent of the atmospheric circulatio during storms along the shores of the Black, Azov, Baltic, White and Barents Seas; that determines the direction and velocity of the storm wind at the surface of the earth and co responding transport in the 1–5 km layer, and that the law of distribution of air masses fro the sea to land and vice versa, first developed by V. V. Shuleĭkin (**Fizika Moria, 1953,** p. 494 *see* 6.2–2, Feb. 1955, *MAB*), determines the salt content of the atmosphere over continents A possible mechanism for the transport of sea salt to the land is presented. *Subject Heading* **1. Nuclei origin 2. Saline nuclei.**—*I.L.D.*

10.10–284 551.574.11:551.501.774:546.1

Durbin, W. G., **Some aircraft observations of the vertical and horizontal distributions o chloride particles.** *Geofisica Pura e Applicata,* Milan, 42:11–20, **1959.** 7 figs., table. **DLC**— A description with illustrating slides is given of the gelatin-silver nitrate technique for identify ing chloride particles. Results of samples taken on many flights from an aircraft of th Meteorological Research Fight both in the horizontal and vertical are given. The relationshi of these particles and relevant meteorological parameters are discussed. *Subject Heading* **1. Nuclei measurement from aircraft 2. Chloride particle identification.**—*Author's abstract.*

10.10–285 551.574.11:551.594.

Mühleisen, R., **Die luftelektrischen Verhältnisse im Küstenaerosol I.** [Atmospheri electrical conditions in coastal aerosol, Pt. 1.] *Archiv für Meteorologie, Geophysik und Bio klimatologie, Ser. A,* Vienna, 11(1):93–108, **1959.** 5 figs., 2 tables, 14 refs. English an French summaries p. 93–94. **DWB, DLC**—In order to study the electrical qualities of th aerosol over the sea and the coast, the atmospheric electrical field and the space charge densit have been recorded at the surface on the coast of the North Sea, especially in connection wit wind, surf and motion of the sea. The values of the field, which have been found higher an more variable than those on the continent, can be explained by the positive electric spac charges measured in the sea air. These space charges are transported over the continent an influence the fine-weather field over a certain distance. Most of the positive charges probabl arise in the land-swell. The question is discussed whether the maritime aerosol-particle which are found by many authors have an electrical charge. *Subject Headings:* **1. Maritim aerosol electricity 2. Atmospheric electricity measurement 3. Electric charge distribution** —*Author's abstract.*

10.10–286 551.574.11:551.511:546.1

Podzimek, J., **Relation between concentrations of giant chloride nuclei and exchange i the atmosphere.** *Geofisica Pura e Applicata,* Milan, 42:133–139, **1959.** 6 figs., 12 refs **DLC**—In northern Bohemia 33 research flights were made during which concentration of gian

ondensation chloride nuclei was measured up to a height of 3500 m above the earth's surface. hloride particles were determined by traces left by them on a sheet of gelatine with silver itrate (Liesegang circles). The actual size of the particles was obtained by comparison of articles of a known size, falling in a sedimentation tube, with images on the sensitive sheet, nd the result was adapted to the analysis of samples during the flight. For each level at hich a sample was exposed the spectrum of the sizes of nuclei was determined. During the ear the average concentration of the giant chloride nuclei at a height of 100 m above the earth as 7.3×10^{-3} cm^{-3}. At greater heights concentration of the nuclei decreased successively, o that at 2000 m it was only 0.3×10^{-3} cm^{-3} and above the level of 3000 m the nuclei occurred poradically, on the whole. Under the influence of atmospheric exchange the concentration f the nuclei in the boundary layer up to 1000 m above the earth's surface changes considerably oth during the day and during the year. The highest concentration occurs at a height of everal hundred metres above the earth in the winter months during the morning and evening ours, i.e. during a more stable temperature lapse rate. From the established concentrations f the nuclei, relation between the turbulent diffusion coefficient and the height above the arth was determined. Its average value during the year increases up to a height of 300 to 00 m above the earth. Above this level it decreases roughly according to the relation of $\sim z^{-6/7}$. The exponent changes not only with temperature stratification (with the time of lay and year), but also with the average wind speed. For sodium chloride particles of 2.5μ in liameter the maximum value of turbulent diffusion coefficient (at level of 400 m), reaches bout 18×10^3 cm^2 sec^{-1} while the minimum value is about 5×10^3 cm^2 sec^{-1} (above 2,000 m). *Subject Headings:* **1. Chloride nuclei size determination 2. Giant nuclei 3. Austausch-nuclei elationships.**—*Author's abstract.*

10.10–287 551.574.12

Deriagin, B. V. and Dukhin, S. S., **O vliianii termoforeza na koaguliatsiiu oblachnykh kapel'.** [Influence of thermophoresis on the coagulation of cloud drops.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofizich.*, No. 6:779–784, June **1957.** 5 refs., 20 eqs. **DLC**—The temperature of cloud droplets is usually different from the local temperature of the vapor gas mixture. Since the drop in temperature is established over a distance of the order of the radius of a drop, even in the case of a small drop the temperature gradient in the vicinity of the drop can attain such a magnitude that thermophoretic forces can exert considerable influence upon the movement of aerosol particles near the droplet. The temperature field and the corresponding thermophoretic forces in the vicinity of droplets, the dimensions of which cannot exceed a score of microns, are analyzed theoretically. An equation expressing the thermophoretic force acting from one drop, 1, upon another droplet, 2, is derived namely:

$$F_{12}=\frac{q\pi n^2R_1R_2[LD(q_1-q_\infty)+x_a(T_1-T_\infty)]}{\rho T(2x_a+x_i+2LDq_s(T^*)/\Omega}\,\frac{r_{12}}{r^3{}_{12}}$$

Also an equation for evaluating the effect of electrostatic factors is presented. And the interelation of electrostatic and thermophoretic forces on the coagulation of droplets is analyzed. *Subject Headings:* **1. Droplet coagulation 2. Thermophoretic effect on cloud drop coagulation.** —*I.L.D.*

10.10–288 551.574.12:551.501.774

Georgii, Hans-Walter, **Neue Untersuchungen über den Zusammenhang swischen atmosphärischen Gefrierkernen und Kondensationskernen.** [Recent studies on the relationship between atmospheric freezing nuclei and condensation nuclei.] *Geofisica Pura e Applicata*, Milan, 42:62–72, **1959.** 6 figs., 14 refs. German and English summaries p. 62. **DLC**—Parallel measurements of freezing nuclei and condensation nuclei were carried out at three different locations—Frankfurt/M, Taunus observatory and Zugspitze—under various weather conditions. During these investigations a strong relation between the activation-temperature of freezing nuclei and the particle size of the condensation nuclei was detected and confirmed with different methods. *Subject Headings:* **1. Freezing nuclei—condensation nuclei relationships 2. Condensation nuclei measurements.**—*Author's abstract.*

10.10–289 551.574.2:551.578.

†Schulz, Werner, **Untersuchung zur Frage der Entstehung der Eisphase aus unterkühlte Wassertropfen.** [Investigation of the formation of ice phase from supercooled water drops] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, Vienna, 11(1):64–83, 195 9 figs., 3 tables, 50 refs. English and French summaries p. 64. **DWB, DLC**—Droplets 5 to 25μ diameter have been produced by condensation on different metallic mirrors and supe cooled until congelation, which begins at $-10°$C and increases from $-15°$ downward, wi a maximum between $-20°$ and $-24°$. An underlying metallic surface favors the freezi process (in agreement with JACOBI; *see* 7.9–193, Sept., 1956, *MAB*), probably because of i high thermal conductivity. The freezing temperature depends neither on the size of t droplets nor on the speed of refrigeration. *Subject Headings:* **1. Ice phase formation 2. Free ing of supercooled water 3. Condensation processes.**—*Author's abstract.*

FOG

See: **Fog frequencies, Hungary** (Antal), 10.10–177.

CLOUDS

See: **Cloud flying** (Gotch), 10.10–34; **Turbulence in clouds** (Gorelik et al.), 10.10–140; **Artificial cumulus formation** (Dessens), 10.10–183.

PRECIPITATION

See: **Precip. distribution, U.S.S.R.** (Sharova), 10.10–29; **Drought, Tatar Republic** (Blagoveshchenskiĭ), 10.10–106; **Precip. effects on forest hydrol.** (Baumgartner), 10.10–111; **Drought estimation in forest fire control, southeastern U. S.** (Nelson), 10.10–113; **Radar rainfall meas.** (Hiser et al.), 10.10–141; **Annual precip. summaries, Yugoslavia,** 10.10–149; **Rainfall charts, S. Africa,** 10.10–150; **Radar precip. echoes** (Lhermitte), 10.10–169; **Radioactive precip.** (Gerlach et al.), 10.10–217; **Cold front effects on precip., China** (Yeh et al.), 10.10–239.

RAIN, SNOW AND HAIL

See also: **Hail rockets** (Ruby), 10.10–185; **Hail rockets,** 10.10–187; **Chloride concentration in rainwater** (Junge, Gustafson), 10.10–194; **Freezing of supercooled water** (Schulz), 10.10–289.

10.10–290 551.578.462:551.579.2:778.3

*Kalinin, G. P. and Zmieva, E. S., **Ob ispol'zovanii aerofotos"emok dlia izucheniia protsess skhoda snezhnogo pokrova.** [Use of aerial photography in the study of the process of sno cover melting.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, No. 44(71):107–118, 195 3 figs., 5 tables, 2 refs. **DWB**—On the basis of snow surveys by means of aerial photograph carried out in the basins of the Devitsa and Oka Rivers, the authors compared the exactness o visual and photographic observations in determining the degree of snow cover of an area an the errors arising when data of several stations are extended over an entire area of a catchmen basin. A comparison of visual with aerial photographic data for small areas (4–5 km) indicate the possibility of considerable differences between them. These differences are the result o extreme uneveness in the disappearance of snow in dissected terrain and, hence, uneve distribution and errors due to visual observation. The statistical procedure for evaluating th exactness of the average snow cover areas and the equations for computing the mean squar error of the deviation is developed namely, $\sigma = 100\sqrt{k-k^2}$ where $k = n/N$ (n = number of point with snow, N = total number of points with and without snow). The general form of th mean square deviation is $\sigma = \alpha 100\sqrt{k-k^2}$ where α = coefficient depending upon dimensions o partial areas on the basis of which the mean snow cover is determined; with $\alpha = f(F)$ wher F = dimension of partial area $\alpha = 1/1 + 1.15\ F^{0.22}$ and $\sigma_0 = (100/1 + 1.15\ F^{0.22})\sqrt{k-k^2}$ (σ_0 = erro of computed means). Data on the magnitude of mean square deviation for different particula

areas computed by the equation and the necessary number of observations for obtaining mean errors not exceeding 5 and 10%, data showing that the formula derived from a normal distribution provides values of snow cover area with a small error, and data on the variation of snow cover during snow melt on differently exposed and forested areas, are presented. Also the dynamics of snow melting in forested areas and diverse terrain are discussed briefly. *Subject Headings:* **1. Snow melt observations 2. Aerial photography of snow melt.**—*I.L.D.*

10.10–291 551.578.462:551.579.2

Komarov, V. D., **O raschete vodootdachi taiushchego snezhnogo pokrova.** [Calculation of the water released by melting snow cover.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, No. 44(71):89–94, **1956.** 3 tables, 13 refs., 14 eqs. **DWB**—The author discusses the physical structure of snow cover not subject to thawing, of dry snow previously subject to thawing, and of snow cover subject to intermittent and extensive thawing, and the water retention capacity of snow and its role in snow melting. As a result of the ability of snow to hold water, the beginning of water yield by a snow cover is retarded in relation to the beginning of melting and the intensity of water yield exceeds that of snow melting after the start of water yield. It is shown that if the water retention capacity of snow for a given time interval is constant then the amount of water yield is given by $h_w = h_T/1-\alpha_1$ where h_T = amount of melting snow for the given time interval (mm layer) and α_1 = water retention capacity of snow at start of time interval. Data are presented to show that the structure of the snow cover at the beginning of snow water yield usually is medium grained and at times macrogranular, so that in calculating water yield the expression: $h_w = h_T/1-\alpha = h_T/1-0.13 = 1.15h_T$ can be used; $\alpha = 0.13$ is the mean for medium grain and large grain snow. In case of springs following severe winters, when water yield may begin in the case of weakly recrystallized snow and the snow structure is altered, the water yield capacity is computed by means of $h_w = (h_T/1-\alpha_1)+x(\alpha_1-\alpha_2)$ where α_2 = water retention capacity of snow at the end of the time interval; x = amount of snow (wet) remaining at the end of the time interval, and remaining terms are as above. The author discusses also the relationship between the water content of snow and its density, the amount of snow moisture measured during daylight hours, etc. *Subject Headings:* **1. Snow melt mechanism 2. Water content of snow pack 3. Snow melt runoff computation.**—*I.L.D.*

10.10–292 551.578.462:551.579.2:551.588.6(476)

Uryvaev, P. A., **Raspredelenie i staivanie snega na vodosborakh.** [The distribution and melting of snow in drainage basins.] *Meteorologiia i Gidrologiia*, Leningrad, 9:33–35, **1957.** fig., ref. **DWB, DLC**—The use of probability curves for the water content of snow is unsatisfactory for determining areas of simultaneous snow melt because the relationship between the water yield of snow and snow deposits has been insufficiently investigated, because the probability curves of snow deposits on water basins have not been studied sufficiently, etc. Accordingly, the author has replaced the probability curve of snow deposits with curves expressing the relationship of area of earth patches free from snow to the magnitude of the snow deposits. Such curves constructed for individual years for a forested and deforested area in the Valdai Hills are presented. The curve for the forested area resembles a parabola with the apex at the intersection of the coordinates. The first patches of snow free ground appear after 25% of the initial snow deposits have become water; when half of the snow has melted the snow free patches constitute 12%; subsequently a comparatively small decrease of snow deposits leads to a sharp increase of snow free earth. In the case of the almost deforested area the general form of the curve is retained but at the apex it has a greater slope than in the case of the forested area. The first patches of snow free earth appear when the decrease of snow deposits is equal to 10% of the initial deposits. When the decrease is equal to half of the snow deposits the snow free ground amounts to 27% of the area of the catchment basin. Where the snow deposits are a maximum the curves of the forested and deforested areas are similar. But where they are a minimum, the curve of the deforested area becomes convex and does not pass through the intersection of the coordinates. The utilization of such curves for the southern part of European U.S.S.R. and the significance of such curves are discussed. *Subject Headings:* **1. Forest influences on snow melt 2. Snow cover distribution 3. Snow melt runoff computation 4. Valdai Uplands, U.S.S.R.**—*I.L.D.*

HYDROMETEOROLOGY

See also: **Symposium on Ground Water, New Delhi, 1955,** 10.10–2; **Hydrologic investigations, Valdai, U.S.S.R.** (Uryvaev), 10.10–18; **Glacial floods, Lake Argentino and Moreno Glacier** (Heinsheimer), 10.10–82; **Soil moisture regime** (Rudnev), 10.10–109; **Soil moisture deficiency** (Razumova), 10.10–110; **Calculation of melt water retention** (Popov), 10.10–125, **Calculation of melt water runoff** (Kharshan), 10.10–139; **Snow melt obs.** (Kalinin, Zmieva), 10.10–290; **Water content of snow pack** (Komarov), 10.10–291; **Snow melt** (Uryvaev), 10.10–292.

10.10–293 551.579.2:551.579.

Kalinin, G. P. and Makarova, T. T., **Ob opredelenii poter' talogo stoka v rechnykh basseĭnakh.** [Determination of meltwater runoff losses in river basins.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy,* No. 44(71):38–48, **1956.** 4 figs., 4 tables, 13 refs., 9 eq **DWB**—Among the hydrological elements determining meltwater losses in river basins (sprin runoff), the infiltration of water in frozen soil is an important one. Experimental investiga tions of infiltration of water in frozen soil can serve as a basis for forecasting runoff. TH elaboration of a calculation procedure for determining water loss by infiltration involves th following assumptions: (1) the area over which infiltration takes place is equal to the area the basin covered with melting snow and flowing water, and accumulated water on the surfac of the basin; (2) the thawing parts of the soil influence slightly the change with time in th overall rate of infiltration of the basin; and (3) the losses due to evaporation can be neglecte For computing the infiltration of water into the soil the formulas of K. I. KASHIN are use namely—$v = k\,de^{-kt}$ and $p = d(1-e^{-kt})$ where v = rate of infiltration of water; d = soil moistur deficit; t = time of arrival of water to the catchment area; p = general amount of losses b infiltration; k = parameter characterizing the aqueous-physical soil properties. Instead of the difference $d-d_0$ is used in the case of frozen soil where d_0 = moisture deficit at which in filtration ceases. On the other hand in the general case a part of the water may infiltrat through the relatively nonpermeable layer and also through parts of thawing snow, meltwate soil, etc. The total amount of water infiltrated into the soil is greater than $d-d_0$ by B. B replacing $B-d_0$ with c; $v = (d+c)e^{-kt}$ and $p = (d+c)(1-e^{-kt})$. The use of these formulas i computing the infiltration magnitudes for different values for k and t in meltwater runoff fc the Oka River at Kaluga, for 1948, is illustrated. The annual computed duration of sno melt can be calculated with the formula $t_p = x/i_c$ where i_c = mean intensity of snow melt t_p = mean computed duration of snow melt. Then $v = kd_1e^{-kx/i_c}$ and $p = d,(1-e^{kx/i_c})$. I the first formula x = a variable magnitude and equal to the layer of water of the melting sno at any moment of time and in the second equation x = total layer of snow reserves and precipita tion falling on its surface. *Subject Headings:* **1. Snow melt runoff 2. Infiltration computatio calculation.**—*I.L.D.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY

See: **Symposium on climat. and microclimat. of arid zones, Canberra, 1956** (UNESCO), 10.10–3; **Climat. service, Yugoslavia** (Jovičić), 10.10–59; **Aviation climat., Alaska** (Wood, Gleason), 10.10–105.

CLIMATE OF PARTICULAR PLACES

See: **Soil-climate relationships, Azerbaidzhan** (Volobuev), 10.10–20; **Climatic atlases, Egypt, S.W. Asia** (Thornthwaite), 10.10–32; **Climate, Arctic** (Machowski), 10.10–53; **Climat. bibliog., Angola** (Carraway), 10.10–68.

CLIMATIC CHANGES

See also: **Climatic changes, Arctic** (Riccardi), 10.10–55.

10.10–294 551.583 551.509.33:551.524.3

†Křivský, L., **Kolísání podnebí u nás a klimatologická prognosa pro nejbližších několik esetiletí.** [Climatic variations in Czechoslovakia and climatic forecasts for the next few ecades.] *Meteorologické Zprávy*, Prague, 10(3):71–72, **1957.** 22 refs. Russian and English ummaries p. 71. **DWB**—Works of several Czechoslovak authors on climatic variations in zechoslovakia are reviewed and their results are summed up and extrapolated. Temperature onditions for the next decades are expected to be steady, with moderate seasonal variations. No general prediction can be made for precipitation, because of the regional variability of this lement, and a lack of an adequate sample of long period precipitation variations. *Subject leadings:* **1. Climatic variations 2. Long range temperature forecasting 3. Czechoslovakia.** —*G.T.*

10.10–295 551.583.2:551.510.41

Flohn, Hermann (*Frankfurt a.M.*), **Bemerkungen zum Problem der globalen Klimaschwankungen.** [Notes on the problem of world-wide climatic variations.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, Vienna, 9(1):1–13, **1958.** 2 tables, 37 refs. English and French summaries p. 1. **DLC**—Based on the spectrum of atmospheric turbulence in time and space, the author discusses the possibility to extend the climatic variations beyond the earth's atmosphere. The global increase of temperature and sea level leads to the existence of a surplus or a deficit in the global balance, the terms of which—especially water balance and CO_2-cycle—are discussed. The difference between the observed increase of CO_2 content and the decreasing portion of C^{14} may be due to man-made destruction of vegetation. The climatic variations of the last 1000 years may caution against an overestimation of the CO_2-hypothesis. *Subject Headings:* **1. Climatic changes 2. Carbon dioxide hypothesis of climatic changes.**—*Author's abstract.*

MICROCLIMATOLOGY

See also: **Symposium on climat. and microclimat. of arid zones, Canberra, 1956** (UNESCO), 10.10–3.

10.10–296 551.584.42:633.491

Muminov, F. A., **Osnovnye cherty mikroklimata kartofel'nogo polia.** [Main features of the microclimate in a potato field.] *Akademiia Nauk Uzbekskoĭ SSR, Tashkent, Izvestiia, Ser. Fiziko-Matematicheskikh Nauk*, No. 1:75–87, **1958.** 5 figs., 2 tables, 8 refs. Summary in Uzbek, p. 87. **DLC**—The observations were carried out in the summer of 1955 at the Uzbek experimental vegetable-potato station. The study consisted of the determination of: direct and diffuse radiation; radiation balance; temperature and humidity of the air at various heights (1–200 cm); soil temperature on the surface and at 5, 10, 15, 20 cm depth; evaporation from the earth's surface; wind speed and direction at 50, 100, 200, 500, 750 m height; extent of shading and albedo of the field. The results are presented in tables and graphs. It was found that at the beginning of the vegetative period the changes of meteorological conditions are mainly determined by irrigation and, to a lesser extent, by the plants themselves. Towards the end of the season, it is the plants that are the main factor for meteorological changes in the microclimate of the field. *Subject Headings:* **1. Potato field microclimatology 2. Potato cultivation 3. Uzbek S.S.R.**—*A.M.P.*

10.10–297 551.584.65:551.513.1

Gressel, W., **Über die Bewetterung der alpinen Höhlen.** [On the weather of alpine caves.] *Meteorologische Rundschau*, Berlin, 11(2):54–57, March/April **1958.** 14 refs. **DWB, DLC**—The meteorological conditions and processes within caves and the relationship between the weather of caves and circulation conditions in the free atmosphere are examined. From the meteorological point of view caves are classified into dynamic, static and static-dynamic. The dynamic cave system possesses two openings, so that its weather is an extension of the outside weather; the static cave system possesses only one opening and in it the circulation is determined

principally by temperature, and depending upon whether the caves ascend or descend from th entrance, they are either cold or warm static caves; the static-dynamic cave system is on on hand connected with the external atmosphere and on the other possesses closed side area which are not influenced by cave weather. There are also thermal caves in which the tem perature conditions are determined by traversing thermal waters. A more detailed analys of the weather of the dynamic cave system, based upon observations in the Geldloch (Otschev Lower Austria) and in the Eisriesenwelt, the largest ice cave in the world in the Tennengebirg (Salzburg), is presented. The dependence of dynamic cave weather upon dynamic atmospheri processes such as pressure changes, gradient slopes and wind conditions rather than upo temperatures is discussed. A detailed description of the seasonal variation of the ice formation in the Eisriesenwelt, of the atmospheric circulation conditions in the free atmosphere in th mountains outside the cave and the resultant climate within the cave is presented. Als the general characteristics of weather and climate in dynamic cave systems are considered *Subject Headings:* **1. Cave air classifications 2. Cave micrometeorology 3. Cave air-at mospheric circulation relationships 4. Eisriesenwelt, Salzburg.**—*I.L.D.*

CLIMATIC CLASSIFICATION

See also: **Symposium of climat. and microclimat. of arid zones, Canberra, 195** (UNESCO), 10.10–3.

10.10–298 551.585 551.586:612.014.

Nicolas, J. P., **Les climats africains en biogéographie humaine.** [African climates i human biogeography.] *Institut Français d'Afrique Noire, Bulletin, Sér. B,* 20(1/2):7–67 Jan./April **1958.** 2 figs., 14 graphs, 3 tables, 4 refs. **DWB**—Statement of a classification c climates appropriate to the field of human biogeography. This classification is based on thre climatic factors: temperature, vapor pressure and wind speed, taking into consideration th means of the observations made at 8h and 13h (monthly means). This classification comprises natural complexes, exothermic complexes, and endothermic complexes subdivided into variou groups (torrid hygropsychic, warm hygropsychic, hygrothermopsychic, eolothermopsychic aeolian and aeolopsychic). From another point of view five classes are defined: healthy (severe harsh, stable and mild); relaxing (soothing, depressing, debilitating); unhealthy (unhealthy t a slight extent, unhealthy, highly unhealthy); pathogenic (diluting, highly diluting, submortall and fatal. Lastly, the author defines the terms relating to the modes: atonic, hypotonic relaxing, tonic, hypertonic, constricting and hyperconstricting. The author applies thi classification to 17 stations of French West Africa spaced out from the equator to the Sahara *Subject Headings:* **1. Climatic classification 2. Human biogeography 3. Environmenta effects.**—*A.V.*

BIOCLIMATOLOGY

See also: **Climatic effects on plants** (Lundegårdh), 10.10–15; **Agric. climat., U.S.S.R.** (Ventskevich), 10.10–107; **Weather effects on disease** (Tromp), 10.10–116; **Climat. effects on rheumatism** (Trauner), 10.10–117; **Weather effects on disease** (Daubert), 10.10–118; **Föhn in relation to medical met.** (Undt), 10.10–119; **Met. elements in relation to illness** (Picko), 10.10–120; **Weather effects on rheumatism** (Kamiyama et al.), 10.10–121; **Climatic classification and human biogeography** (Nicolas), 10.10–298.

10.10–299 551.586:551.510.42:576.8

Gourmel, M.; Baute, R.; Bellocq, L. and Canellas, J. **Sur les rapports entre les condi tions météorologiques et la flore mycologique et pollinique.** [The relationship betwee meteorological conditions and the spore and pollen producing flora.] *Académie des Sciences Paris, Comptes Rendus,* 247(1):121–122, July 7, **1958.** ref. **DLC**—The authors study th influence of climatological factors on the high pollen and mold content of the atmosphere in th region of Pau. The relations with the air masses indicate that the streams from northeas to southwest bring great quantities of mold, those from southwest to southeast determin strong pollen yields; the stream from southwest makes it possible to collect on the same da a large quantity of pollen and mould. *Subject Headings:* **1. Bioclimatology 2. Pollen an mold in the atmosphere 3. Pau, France.**—*A.V.*

10.10–300 536.62:551.586:612.5

Rosset, Robert, **Progrès récents en microcalorimétrie biologique.** [Recent progress in biological microcalorimetry.] *La Nature*, Paris, No. 3287:97–100, March **1959.** 9 figs., ref. **DLC**—Statement of the principles of calorimetry and description of two classical types of calorimeters (adiabatic type and isothermic type) and of the apparatus designed by A. TIAN and improved by E. CALVET. Some applications of this device in the biological field are reviewed. Thermogenesis of germinating seeds makes it possible to determine the germinative qualities of seeds. The study of the thermogenesis gradient of plants shows that a flower, at the moment of its opening, may develop 30 times as much heat as the stalk that bears it. Resorting to calorimetry also permits precise studies on the physiology of animals and insects. The author points out applications relating to thermogenesis of animals with variable temperature and thermogenesis of homeothermal animals. *Subject Headings:* **1. Microcalorimetry 2. Thermogenesis of plants and animals.**—*A. V.*

10.10–301 551.586:551.515.8:577.39

Kérdö, I. (*Hungary*), **Eine neue Untersuchungsmethode zur Erfassung der Veränderungen der vegetativen Reaktionslage unter dem Einfluss meteorologischer Faktoren.** [A new method of investigation for determining the reaction of the autonomic nervous system under the influence of meteorological elements.] *International Journal of Bioclimatology and Biometeorology*, Leiden, Vol. 1 (Pt. 4, Human Bioclimatology), **1957.** 2 p. eqs. **DWB**—The author states that the ratio diastolic blood pressure (d) measured in mm Hg and the pulse rate per minute (p) d/p is approximately equal to unity in cases of autonomic equilibrium. The quotient is less than unity when the autonomic tonus is displaced in the direction of the sympathicus; as the diastolic pressure diminishes and pulse rate increases. The diastolic pressure increases and pulse rate increases in the case of parasympathicus tonus. An "autonomic index" is obtained by multiplying the deviations d/p from the normal value of unity, i.e. $A.I. = [1 - (d/p)] \times 100$. Evidence is presented showing that A.I. is closely related to the adrenalin concentration in blood serum. A.I. values were determined in psychotic patients treated with insulin. The patients showed a greater reaction on July 26 than on July 24. On the former day a warm front passage was observed. The sympathicus stimulating effect of the warm front had produced an intensified counterreaction. *Subject Headings:* **1. Autonomic nervous system 2. Frontal effects on nervous reaction.**—*I.L.D.*

ENVIRONMENTAL INFLUENCES

See: **Topographic effects on precip.** (Sharova), 10.10–29; **Orographic effects on wave movements** (Tardos), 10.10–229; **Forest influences on snow melt** (Uryvaev), 10.10–292.

MISCELLANEOUS

OPTICAL PHENOMENA

See: **Atmos. refraction** (Meyer), 10.10–38; **Twilight illumination** (Link), 10.10–249.

ELECTRICAL PHENOMENA

See: **Eclipse effects on ionosphere** (Minnis), 10.10–209; **Coastal aerosol elec.** (Mühleisen), 10.10–285.

AURORAS

See also: **IGY auroral program** (Adem), 10.10–94.

10.10–302 551.594.5:551.521.67

†Vegard, L., **Recent progress relating to the study of aurorae and kindred phenomena.** *Geofysiske Publikasjoner*, Oslo, 20(4), Jan. **1958.** 16 p. 2 figs. (incl. photo), 3 tables, 31 refs., eqs. **DLC, DWB**—From auroral studies it was found that the structure of the ionosphere, the zodiacal light, the solar corona and the bundles of electric rays which produce auroras and

most magnetic disturbances is due to the photoelectric effect of solar X-rays of various fr quencies and different distributions. The electric bundles producing the auroras are form by photoelectrons from the sunspot area and neutralized by positive ions, mainly proto In the years 1939–41 it was found, by means of Doppler effect, that the bundles carried proto with velocities amounting to at least 2.10^8 cm/sec. The neutralized bundles led to an auro theory essentially similar to the BIRKELAND-STÖRMER theory, but vatiation of the proton fl in the bundle led to many consequences which could be verified with spectral studies of t auroras. Thus variations with latitude and altitude were found in accordance with theo From the fact that protons and electrons give essentially different spectra a number of va ability effects could be explained. Thus the red auroras of type A and B were found to be d to protons and electrons, respectively. Recently detected enhancements of atomic lines we found to be due to increase in the relative proton flux. The velocity of protons is as a ru much smaller than that of the electrons. Consequently the bundle carries a surplus of negati electricity into the atmosphere where it produces electric and magnetic disturbances of vario kinds, and gives the earth a negative charge. Temperature measurements from N_2^+ ban corresponding to altitudes of several hundred km gave no indication of any increase of te perature with altitude. *Subject Headings:* **1. Auroral research 2. Solar x-rays.**—*Autho abstract.*

10.10–303 551.594.51:535.33:546.

†Bagariatskiĭ, B. A., **Vodorodnaia emissiia v spektrakh poliarnykh siianiĭ.** [Hydrog emissions in auroral spectra.] *Uspekhi Fizicheskikh Nauk*, Moscow, 65(4):631–665, 19 22 figs., 5 tables, 39 refs., 23 eqs. **DWB**—A thorough technical review of the recent literatu on hydrogen lines in the auroral spectra and related problems. The empirical data are fi analyzed and systematically reviewed (with tables, graphs and outlines). Then the theo is exhaustively treated, with many theoretical curves and cross sections by various autho reproduced. Variations with geographic latitude and longitude, height, season and solar geomagnetic conditions are noted. Of the 39 articles cited 8 are from Russian and 31 fr western sources. *Subject Headings:* **1. Auroral spectra 2. Hydrogen lines in aurora.**—*M. K*

10.10–304 551.594.51:546.

†Galperin, G. I. (*Acad. of Sciences U.S.S.R., Moscow*), **Hydrogen emission and two typ of auroral spectra.** *Planetary and Space Science*, N. Y., London, 1(1):57–62, Jan. **1959.** figs., 22 refs. **DLC**—Various characteristics of auroral activity have been correlated with t hydrogen emission. This emission has been studied with the CII-48 and CII-47 spectrograp having dispersions of 85–95 and 200 Å/mm, respectively. The observations were made at t Loparskaya station of this Institute where the geomagnetic latitude is 64°. The correlatio include the intensity of H_α with: (1) K-index, (2) atomic lines of OI, OII, NI and N (3) molecular bands 1 NG and 2 NG of N_2^+ and 1 NG of O_2^+, (4) intensities of H_β and H_γ well as their profiles and (5) radio reflections. (For additional information, *see* Pt. 3, p. 15 Oct. 1959, *MAB.*) *Subject Headings:* **1. Auroral hydrogen lines 2. Auroral spectra.**—*Autho abstract.*

10.10–305 551.594.51:535.

Harrison, A. W. (*Canadian Armament Res. & Dev. Estab., Canada*) and Jones A. Vallan (*Physics Dept., Univ. of Saskatchewan*), **Observations of Meinel N_2^+ bands near 1.5μ in t auroral spectrum.** *Journal of Atmospheric and Terrestrial Physics*, London, 13(3/4):291–29 Feb. **1959.** 2 figs., table, 10 refs. **DLC**—The 0.1 and 1.2 Meinel bands have been observ in the auroral spectrum at 1.46μ and 1.53μ. The maximum observed absolute brightnesses these bands were found to be 148 and 426 kilorayleighs (kR), respectively. The brightne of the 1.2 band appears to be anomalously high and this may be a result of preferential excit tion by collision with $O^+(^2D)$ ions. A feature of high but fluctuating brightness at 1.5 agrees in wave length with the 2.3 N_2^+ band but appears to be somewhat brighter than consistent with this identification. It is possible that the latter emission may arise from t excitation in aurora of the $0.1'\Delta_g - {}^3\Sigma_g - O_2$ band. An unidentified emission has been observ at 1.61μ on some of the auroral spectra obtained. *Subject Headings:* **1. Auroral emissio 2. Auroral spectral intensity.**—*Authors' abstract.*

10.10–306 551.594.51:546.17

Herman, L. and Morel, J. (*both, Laboratoire des Recherches Physiques, Sorbonne*) and Herman, R. (*Obs. de Paris-Meudon*), **Émission du spectre de l'azote dans les aurores de haute altitude.** [Emission of nitrogen spectrum in high latitude auroras.] *Annales de Géophysique*, Paris, 12(3):228–231, **1956.** 2 figs., 2 tables, 8 refs., eqs. **DLC**—From a number of previous observations on the emitted spectrum in high latitude auroras, and the experimental results in the laboratories, a definite relationship has been established. Different bands of the emitted electrons and protons from auroras have been studied as to their chemical dissolution as they traverse the atmosphere. A mathematical approach is presented in the report. *Subject Heading:* **1. Auroral nitrogen bands.**—*N.N.*

10.10–307 551.594.51:535.33:621.396.8

Manring, E. R. and Pettit, H. B. (*both, GRD, A.F. Camb. Res. Center, Mass.*), **Photometric observations of the 5577 A and 6300 A emissions made during the aurora of Feb. 10–11, 1958.** *Journal of Geophysical Research*, Wash., D. C., 64(2):149–153, Feb. **1959.** 7 figs., table, 4 refs. **DLC**—The intense auroral activity of Feb. 10–11, 1958, was recorded on airglow photometers at Sacramento Peak, N. Mex., and at Tonantzintla, Mexico. At Sacramento Peak the whole sky varied in intensity from 10^8 to 10^8 Rayleighs for the 6300 A emission, and from slightly less than 10^3 to more than 10^4 Rayleighs for the 5577 A emission. The ratio of the intensity of the 6300 A emission to that at 5577 A was about 2.5×10^3 throughout the night. There was no enhancement of the 5890 A emission. At Tonantzintla, the 5577 A emission varied from 200 to 600 Rayleighs. Contour lines of equal intensity were nearly perpendicular to the geomagnetic meridian at both sites. An interesting correlation occurs between absorption measurements of cosmic radio noise made at Boulder, Colo., and the intensity variation of the 5577 A and 6300 A emissions as observed at both Sacramento Peak and Tonantzintla. *Subject Headings:* **1. Auroral emissions 2. Auroral intensity measurement 3. Radio noise-auroral emission relationships.**—*Authors' abstract.*

10.10–308 551.508.93:551.594.52:535.33

Dzhordzhio, N. V., **Nekotorye rezul'taty elektrofotometricheskikh izmerenii poliarnykh siianii.** [Some results of electrophotometric measurements of polar auroras.] *Akademiia Nauk SSSR, Izvestiia Ser. Geofiz.*, No. 5:692–695, **1957.** 6 figs., table, 4 refs., eqs. **DLC**—With the aid of diagrams, the author describes the construction of a universal electrophotometer for studying the illumination of the night sky and the aurora. In addition, results of measurements with this instrument are presented. These include brightness of the night sky in two spectral regions at a fixed point of the sky with coordinates $h = 21°$ and $A = 0$ distribution of the brightness of the night sky with height from the zenith to the horizon. Also equations for evaluating the errors of observation are presented. *Subject Headings:* **1. Auroral luminosity 2. Night sky brightness measurement techniques 3. Electrophotometry.**—*I.L.D.*

10.10–309 551.594.52:778.3

McEwen, J. and Montalbetti, R., **Parallactic measurements on aurorae over Churchill, Canada.** *Canadian Journal of Physics*, Ottawa, 36(12):1593–1600, Dec. **1958.** 5 figs., table, 9 refs. **DWB, DLC**—Height measurements on the lower edges of homogeneous and rayed arcs and bands are reported from 404 photographs taken of aurorae over Churchill (58.8°N, 94.2°W) during the winter of 1957–58 as part of the IGY programme. The frequency distribution in height of 1975 points measured shows a double peak at 101 and 107 km, and a mean height of 104.8 km. The chief factor affecting height of aurora appears to be that of intensity; the mean height of weak aurorae was found to be 107.7 km, while that of strong aurorae was 100.1 km. No difference in mean height of aurorae before and after midnight was observed. Tidal effects in the upper atmosphere did not appear to affect auroral height greatly. The mean heights of aurorae measured during high and low tide conditions showed no appreciable difference. A mean orientation of 105.5° magnetic azimuth was measured for auroral arcs. Auroral motions with speeds up to 2500 m/sec were observed. *Subject Headings:* **1. Auroral height determination 2. Auroral height distribution 3. Churchill, Canada.**—*Authors' abstract.*

PART II. ANNOTATED BIBLIOGRAPHY ON EVAPOTRANSPIRATION, 1956–1959

By: *Geza Thuronyi*

Note: Material on evapotranspiration published up to 1955 was included in the preceding iss of *Meteorological Abstracts and Bibliography* (September 1959). A bibliography on **Evaporati measurement** was published in *MAB*, August 1959, and one on evaporation from specific surfac not involving plant cover will appear in the next issue (November 1959). A cumulative Outli of Contents (Subject and Geographic) for all four evaporation bibliographies will be published the head of the November bibliography.

This bibliography was prepared for and with support from the U. S. Electronic Proving Groun Fort Huachuca, Arizona.

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1956

10J–1 551.573:581.1

Aslyng, H. C., **Water consumption in plant production.** *Handbuch der Pflanzenphysiologi* Berlin, Vol. 3:685–695, **1956.** fig., 4 tables, bibliog., p. 694–695. **DLC** (QK711.R83)—Evaporation evapotranspiration and water consumption of plants in relation to environment and methods measurement, humidity of plant environment; THORNTHWAITE'S and PENMAN'S methods and ap plication by VAN WYK, DE VRIES, VAN DUIN and others, are reviewed and commented on. *Subje Headings:* **1. Evapotranspiration formulas 2. Water consumption of plants.**—*M.R.*

10J–2 551.573:633.51(62

Balls, W. Lawrence, **Water-loss from vegetation.** *Weather,* 11(12):402–403, Dec. **1956.** 7 refs **DWB**—Water loss from a cotton crop in Egypt was 40–50 tons/acre/day, but evaporation from water surface is only 4.1 mm or 17 tons/acre/day. Transpiration measurements on leaves gav 0.76 mg/cm²/min; a small entire plant of <600 cm² leaf area lost water at 11 g/hr. (*Same item* a 8.4–255, April 1957, *MAB.*) *Subject Headings:* **1. Evapotranspiration 2. Cotton 3. Egypt.**— *C.E.P.B.*

10J–3 551.573:551.57

Benton, George S. and Dominitz, Jack, **Measuring evapotranspiration from atmospheric data** *American Society of Civil Engineers, Proceedings,* Vol. 82, Aug. **1956,** Paper 1035 (Journal of th Hydraulics Div.). 26 p. 9 figs., 4 tables, 13 refs., 17 eqs. **DWB**—Data from 22 radiosonde station in the U. S., Canada and Alaska for the year 1949 were used to calculate the evapotranspiratio from large and small areas (Canada, Central U. S., North-Central U. S., and Ohio River Basin) in order to compare accuracy of the author's method (*see* 6.5–205, May 1955 *MAB*) based on th balance of water vapor in the atmosphere, with results obtained by THORNTHWAITE'S method or b using the hydrologic equation. It is found that the author's "atmospheric balance" equation give excellent results for large areas of continental or sub-continental size, if long periods are used, bu not so good results for smaller areas such as 4–8 states in the Midwest. Monthly values for eac

ıre shown graphically, in comparison with THORNTHWAITE's formula, and theory presented. (*Same item as* 9.4–174, April 1958, *MAB.*) *Subject Headings:* **1. Evapotranspiration 2. Hydrologic cycle 3. Thornthwaite's method 4. North America.**—*M.R.*

10J–4 551.573:551.501:551.511

†Bernard, Etienne A., **Le déterminisme de l'évaporation dans la nature: étude des aspects géophysique et écologique du problème dans le cadre du bilan énergétique, Première partie, Généralités théoriques.** [Laws of evaporation in nature: study of the geophysical and ecological aspects of the problem from the point of view of energy balance, Pt. 1, General theory.] *Institut National pour l'Étude Agronomique du Congo Belge, Brussels, Série Scientifique,* No. 68, **1956.** 162 p. numerous eqs. bibliog. p. 159–162.—A major monographic treatment of all of the factors entering into the calculation of evaporation, with emphasis on the theoretical aspects. The basic formulas, molecular diffusion in a boundary layer, turbulent transport of vapor, latent heat, equations for the energy balance, global radiation, heat exchange, friction, Bowen's ratio, Penman's formula and, lastly, the equations for the energy balance of an isolated body (the other 5 chapters deal with infinite horizontal surfaces). An excellent bibliography is appended. (*Same item as* 9.2–28, Feb. 1958, *MAB.*) *Subject Headings:* **1. Evaporation calculation theories 2. Energy balance method of evaporation calculation.**—*M.R.*

10J–5 551.501:551.573

Bernard, Etienne A. and Frere, Michel (*both, Div. de Climatologie de l'Institut National pour l'Étude Agronomique du Congo Belge* (*I.N.E.A.C.*) *Yangambi*), **Une expression pratique de l'évaporation potentielle d'une surface naturelle en climat tropical.** [Practical expression of potential evaporation from a natural surface in a tropical climate.] (In: Angola. Serviço Meteorológico, **Miscelanea geofisica.** Luanda, **1956.** p. 356–366. 4 figs., 5 refs., 14 eqs. **DWB** (M(08) A592mi)—A simple formula is developed for calculating evaporation in tropical conditions by using only average wind speed at 2 m, mean temperature and vapor pressure under shelter. Evaporation rates computed by this formula are compared with measured values with close agreement. Applications to calculating potential evapotranspiration are considered. *Subject Headings:* **1. Evaporation formulas 2. Potential evapotranspiration calculations.**—*G.T.*

10J–6 551.573

Budagovskiĭ, A. I. and Savina, S. S., **Ispariaemost' s poverkhnosti rastitel'nogo pokrova.** [Potential evaporation from vegetation cover.] *Meteorologiia i Gidrologiia,* Moscow, No. 8:20–23, **1956.** fig., 13 eqs. **DWB, DLC**—Using the method of heat balance which involves the solution of the equation of heat balance and of heat flow, the authors develop an equation for calculating potential evaporation from a vegetation cover. It is shown that potential evaporation from a plant cover depends not only on meteorological factors but also upon the developmental stage of the plant cover, and probably also upon the type of cover. (*Same item as* 8.9–244, Sept. 1957, *MAB.*) *Subject Headings:* **1. Potential evaporation 2. Evaporation from plant cover.**—*I.L.D.*

10J–7 551.573:551.579.5:551.585.55

Budagovskiĭ, A. I., **Osnovnye zakonomernosti ispareniia v stepnoĭ zone.** [Main characteristics of evaporation in the steppe.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geog.,* No. 3:23–32, **1956.** 3 figs., 8 refs. **DWB**—The physical process of evaporation from a moist surface in the case of adequate soil moisture is analyzed and is shown to be determined by meteorological elements (temp., atmospheric moisture, wind velocity and residual radiation) and by the character and conditions of the surface. The equation for evaporation derived is $E=\rho D(\beta e_0-e)$, where ρ = atmospheric density, D = integral coefficient of exchange, e_0 = atmospheric moisture at the boundary with the evaporating surface, e = atmospheric moisture at any height and β = a supplementary coefficient consisting of the product of two multipliers (the mean relative humidity of the air at the boundary with the plant cover and the ratio of the maximum vapor tension at the boundary from different parts of the evaporating surface to the maximum water vapor tension corresponding to the mean temperature of the surface). The physical process of evaporation from soil with inadequate moisture is analyzed. Under steppe conditions where only the upper soil horizons are wetted and below them is the so called "clear horizon," the moisture in the upper layer is termed suspended moisture and its maximum corresponds to field capacity. The relationship between expenditure of suspended water (q) and soil moisture is given by $q=a(W-W_p)$ where W = soil moisture, W_p = "moisture of capillary break" and a = coefficient of proportionality. The relation of evaporation to evaporability is expressed by $E=E_0b(W-W_z)$ where E_0 = evaporability, b = tangent of the angle of slope of the straight line (obtained by plotting E/E_0 against soil moisture content for various soil thicknesses). From this equation

$$\frac{W-W_z}{W_N-W_z}=e^{-\eta\Sigma d}$$

is obtained (W = evaporation of suspended water, W_z = moisture of wilting, W_N = critical soil moistur $\eta = \alpha b/y_0$ where α = coefficient of proportionality, y_0 thickness of humid soil layer and d = moistu deficit). The linear character of the dependence of evaporation upon soil moisture is shown to l general. When $E = E_0$, $b = 1/W - W_z$, soil moisture corresponding to this conditions is term critical W_k. When $W \geqslant W_k$ evaporation does not depend upon soil moisture and is equal to evapor bility; when $W < W_k$ evaporation is a linear function of soil moisture and when $W = W_z$ evaporati is zero. The evaporation from bare soil and from soil covered with vegetation and the evaporati at various stage of plant development are analyzed. *Subject Headings:* **1. Evaporation from steppe 2. Soil moisture.**—*I.L.D.*

10J–8 551.571:551.511.33:551.557.3

†Budyko, M. I., **Klimaticheskie usloviia uvlazhneniia.** [Climatic factors governing humidity (In: Budyko, M. I. (*ed.*), **A. I. Voeĭkov i sovremennye problemy klimatologii.** Leningrad, 195 p. 28–44. 7 figs., table, 45 refs.) **DWB**—The work on the problem of the climatic conditio governing the moisture available to the continents from the time of VOEĬKOV to the present both Russia and outside of Russia is reviewed briefly. This is followed by a theoretical analysis of th physical laws underlying the climatic conditions of the humidity of the earth's surface based up the physical processes of moisture and heat exchange on the earth's surface, in particular upon th application of the data of heat balance. The equations for the calculations of evaporation, runo and effective moisture are presented and their theoretical significance and use are discussed. A ma showing the distribution of the radiational index of aridity and graphs showing the annual variatio of the humidity-index in Gorki, Rome, Bombay; the relationship between relative humidity of th soil and radiational index of aridity and the relation between the salinity of water with that betwe evaporation and precipitation, and data on the water balance of the oceans are presented. (*Sam item as* 9.2–222, Feb. 1958, *MAB.*) *Subject Headings:* **1. Humidity 2. Heat balance 3. Aridi index 4. Climatic effects on humidity.**—*I.L.D.*

10J–9 551.573:551.577(262,262.

†*Carter, Douglas B., **The water balance of the Mediterranean and Black Seas.** *Drexel Institu of Technology. Lab. of Climatology, Publications in Climatology,* 9(3); Contract NONR-1617(00 Technical Report, No. 3:125–174, **1956.** 8 figs., 12 tables, 34 refs. **DWB** (M8 D777p)—A thorou treatment of the water balance of the Mediterranean and Black Seas, based on calculated evaporatio precipitation and runoff (from individual stations and for basins) for each season. Charts an tables indicate that previous estimates of evaporation have been greatly over estimated, runoff ha been considerably over estimated, water exchange between the Black Sea and Mediterranean an between the Mediterranean and Atlantic have been over estimated, and precipitation slightly undl estimated. THORNTHWAITE'S method has been used for estimating evapotranspiration for lar basins such as the Nile. Climatic data for 1400 stations and Pe for 325 stations have been used the study. *Subject Headings:* **1. Water balance of seas 2. Evapotranspiration 3. Mediterranea Sea 4. Black Sea.**—*M.R.*

10J–10 551.573:061.6 551.5:

†Davis, John R. (*Purdue Univ., Lafayette, Ind.*), **Evaporation and evapotranspiration researc in the United States and other countries.** Presented as a contribution of the Evapotranspiratio Committee, Hydrology Group, American Society of Agricultural Engineers, Dec. **1956.** 87 p.— state-by-state listing of all of the known projects (226) relating to soil moisture and evapotranspir tion in the U. S. (and Canada, England, Holland, Denmark, Philippines, Puerto Rico, etc.). subject index gives an idea of the range of crops and subjects being studied along these lines. each case the institution, chief investigators, type of project, objectives of study and publication any) in which the work was reported, are indicated. Regional and governmental projects, as we as those sponsored by local or state institutions, are also listed. (*Same item as* 10.5–283, May 195 *MAB.*) *Subject Headings:* **1. Evapotranspiration research projects 2. Agricultural meteorolog 3. United States.**—*M.R.*

10J–11 551.501:551.573:551.48

Demiańczuk, Piotr Paweł (*PIHM-Warsaw*), **Nowe wzory na obliczanie recznej wartoś parowania z terenu zlewni.** [New formula for calculation of the annual evaporation from the surfa of a river basin.] *Przegląd Geofizyczny,* Warsaw, 1(3/4):191–199, **1956.** 2 tables, 5 refs., 28 eq Russian summary p. 199. **DWB, DLC**—Two new formulas are presented for calculation of th annual evaporation from the surface of river basins: $Z = Xth(Zm/X)$ where Z is annual evaporatio X is precipitation, and Zm is maximum possible evaporation; and $-Z = X(1 - e^{-\gamma Zm/X})$ whe $\gamma = X + Z/X$. Comparative results are tabulated for several basins according to several formula namely those of SHREIBER, BAGROV (1953), OL'DEKOP, BUDYKO (1948), MIEZIENCIEV (1955) an

)EMIAŃCZUK (1956). *Subject Headings:* **1. Evaporation from river basins 2. Evaporation calculation theories.**—*M.R.*

10J–12 551.573:551.585.5

Dickson, B. T. (*Canberra Univ. Coll., Australia*), **Challenge of arid lands.** *Scientific Monthly*, Wash., D. C., 82(2):67–74, Feb. **1956. DLC**—The problems encountered in the development of arid lands are discussed under the following headings: water, soils, plants, animals, man and power sources. The section on water contains a discussion on the feasibility of artificial precipitation for increasing the water resources of arid regions, evidence for climatic change in Tunisia and for climatic instability in Palestine during historical time, measurement of evapotranspiration in semiarid and arid regions with special reference to the technique of C. W. THORNTHWAITE, studies of underground water such as that carried out in the Thal Desert area in Pakistan, and the utilization of saline water. The needed areas of soil research for semiarid and arid regions as outlined by CHARLES E. KELLOG are quoted. The physiology of desert plants, physiological stress exerted by desert temperatures on man and the use of wind and solar energy as power sources are reviewed briefly. (*Same item as* 8.3–301, March 1957, *MAB.*) *Subject Headings:* **1. Arid zone climatology 2. Arid zone research 3. Water resources 4. Evapotranspiration.**—*I.L.D.*

10J–13 551.571:551.573:551.577.11

†Drozdov, O. A., **Vlagooborot i problemy izmeneniia kolichestva osadkov.** [Moisture exchange and problems of changes in precipitation amount.] (In: Vsesoiuznoe Geograficheskoe Obshchestvo SSSR, **Voprosy Geografii.** Moscow, **1956.** p. 170–178. 24 refs.) **DWB, DLC** (G58.G35)—This is a review of the most important works found in Soviet and foreign literature dealing with the theoretical and practical aspects of the problem. It is shown that in addition to adequate humidity and favorable conditions of air circulation, local evaporation plays a very important role as a factor in stimulating precipitation. (*Same item as* 10.8–276, Aug. 1959, *MAB.*) *Subject Headings:* **1. Moisture exchange 2. Precipitation formation 3. Evaporation-rainfall correlations.**—*A.M.P.*

10J–14 551.573:551.577.32(52)

Flohn, H. and Oeckel, H. (*Deutscher Wetterdienst, Zentralstelle, Frankfurt a.M.*), **Water vapour flux during the summer rains over Japan and Korea.** *The Geophysical Magazine*, Tokyo, 27(4):527–532, Dec. **1956.** 2 tables, 10 refs., 5 eqs. **DWB, DLC**—Resultant wind and water vapor transfer data up to 400 mb from four aerological stations (Wakkanai, Kimpo, Haneda and Kadena) in Japan are analyzed to show that water vapor flux during the summer rainy period over Japan, Korea and adjacent districts of East Asia, north of lat. 32°N, is directed from west to east or from the continent to the ocean, in a manner similar to that discussed by BENTON and ESTOQUE (*J. Met.*, **1954**; *see* 101–85, Sept. 1959, *MAB*) for North America. It is thus concluded that the source of most of the moisture for summer rains over Japan is the evapotranspiration from the continent, which is calculated as 400–500 mm (610 mm in the Yangtze Kiang Basin). In the basins of S.E. Asia the evaporation is considered to be 830–1150 mm or slightly less than over the ocean. *Subject Headings:* **1. Evapotranspiration 2. Water vapor transport 3. Far East 4. Japan.**—*M.R.*

10J–15 551.501:551.573 551.579.1

Gabites, J. F., **Estimation of natural evaporation and water need.** *New Zealand. Meteorological Service, Meteorological Office Note*, No. 43, **1956? DWB.** "Reprinted from Proceedings of the Conference on Soil Moisture held at Dominion Physical Laboratory, Sept. 1954, and issued in *New Zealand. Dept. of Scientific and Industrial Research, Information Series*, No. 12, **1956**, p. 122–131." 6 figs., 20 refs.—Emphasizes the limitations of the measurement of evaporation and potential evapotranspiration. THORNTHWAITE'S method is used to compute water need and maximum evaporation for New Zealand. A cheap, reliable soil moisture indicator, however, would help the individual farmer more than empirical or theoretical estimates of water need. (*Same item as* 9.1–238, Jan. 1958, *MAB.*) *Subject Headings:* **1. Potential evapotranspiration 2. Evaporation 3. Thornthwaite's method 4. New Zealand.**—*A.A.*

10J–16 551.508.72:551.573

†*Garnier, B. J., **Report on experiments to measure potential evapotranspiration in Nigeria.** *Ibadan, Nigeria. University College. Dept. of Geography, Research Notes*, No. 8, Jan. **1956.** 22 p. 5 figs., tables, 5 refs. **DWB**—Three years of experimental work beginning in 1951 at Univ. College, Ibadan with two simple evapotranspirometers; expanded in 1952 and 1953 to include use of evapotranspirometers modified after MATHER'S (1951) instrument, and extended to Moor Plantation, Ibadan, Samaru, Daura, Port Harcourt and Vom, are summarized and the data presented in tables and graphs. A graphic comparison is made between measured and computed evapotranspiration at Ibadan and Samaru using modified Thornthwaite method. Difficulties in observations and maintenance are discussed. If adjustments are made for flooding, and erroneous readings on rare

occasions, the results are very consistent with those expected. A list of publications of staff of th Univ. College. Dept. of Geography is appended. (*Same item as* 8.3–117, March 1957, *MAB*. *Subject Headings:* **1. Evapotranspiration measurement 2. Evapotranspirometer networks 3. Evapo orimeters 4. Ibadan, Nigeria.**—*M.R.*

10J–17 551.573:581.11(41

Green, F. H. W., **Observations of potential evapotranspiration.** *Nature*, London, 178(4524):104 July 14, **1956.** ref. **DWB**—Evapotranspiration in the Cairngorms (Scotland) in 1955 (a dry year reached 6.8″ in July and 7.1″ in Aug., much higher than figures given by formulas. The year ende with a considerable water deficit, confirmed by stream and well levels, wilting of plants, etc. (*Same item as* 7.11–238, Nov. 1956, *MAB*.) *Subject Headings:* **1. Evapotranspiration 2. Cairngorm Scotland.**—*C.E.P.B.*

10J–18 551.573:581.11

Hesse, Walter, **Ergebnisse von Pflanzentranspirationsmessungen.** [Results of plant tran spiration measurements.] *Annalen der Meteorologie*, 7(1/2):111–118, **1955/56.** 8 figs., 9 refs German and English summaries p. 111. **DWB**—Continuous measurements of transpiration during the growing season are described. Records of barley, oats, wheat, corn and peppermint are shown along with temperature, humidity, light, evaporation, wind, cloud and rain. These enable optimu needs of different plants to be found. Plants are also being tested in a wind tunnel, drying oven climatic chamber, etc. and their water balance examined. This will enable economies to be mad in the use of water. (*Same item as* 7.6–176, June 1956, *MAB*.) *Subject Headings:* **1. Evapotran spiration 2. Plant water requirements.**—*C.E.P.B.*

10J–19 551.573(42

Howe, G. Melvyn, **The moisture balance in England and Wales based on the concept of po tential evapo-transpiration.** *Weather*, London, 11(3):74–82, March **1956.** 6 figs., table, 16 refs Also: Rigg, H. B., **Moisture balance.** *Ibid.*, 11(7):238, July **1956. DWB**—Values of potential evapotranspiration, calculated by THORNTHWAITE'S formula, and of precipitation are plotted monthly for 6 stations. Maps are drawn of average p.e-t. (year and April–Sept.) over England and Wales, seasonal water surplus and water deficiency, and moisture regions based on the "moistur index" (ranging from perhumid to dry sub-humid). By comparison with actual runoff it is found that THORNTHWAITE'S formula gives too high p.e-t. in England. RIGG presents a critical discussion of HOWE'S article. (*Same item as* 7.8–187, Aug. 1956, *MAB*.) *Subject Headings:* **1. Potential evapotranspiration 2. Moisture balance 3. England.**—*C.E.P.B.*

10J–20 551.501:551.57

†Huber, Bruno, **Die Evaporation.** [Evaporation.] *Handbuch der Pflanzenphysiologie*, Berlin Vol. 3:265–284, **1956.** 13 figs., 4 tables, bibliog. p. 282–284. **DLC** (QK711.R83)—A review of current methods of measuring evaporation; dependence of evaporation on environmental conditions; evaporation through perforated membranes; actual evaporation from land and water surfaces (evapotranspiration); annual cycles of ground water, evaporation, precipitation and percolation; the water balance method, austausch method, etc., with ample graphical and tabular illustrative material, experimental data and an excellent reference list. *Subject Headings:* **1. Evaporation measurement techniques 2. Evapotranspiration.**—*M.R.*

10J–21 551.573:633(47

*Kharchenko, K. I., **Rezul'taty izmereniĭ summarnogo isparenііa i transpiratsii razlichnykh sel'skokhoziaĭstvennykh kul'tur v raĭone Sal'skikh stepeĭ.** [Results of measurements of the evapo transpiration and transpiration of various agricultural crops in the region of the Sal steppes.] *Leningrad. Gosudarstvennyĭ Gidrologicheskiĭ Institut, Trudy*, 57(111):147–189, **1956.** 13 figs., 23 tables 3 refs. **DWB**—The Dubovka Hydrological Research Station is located 7 km northwest of Dubovka on the Sal Steppe in the Rostov Oblast. A complex of evaporimeters, soil moisture meters, and meteorological equipment is installed in connection with the experimental grain plots. A plan of the layout and photographs of the soil-evaporimeter are shown in connection with the specifications for the set-up. Summary of characteristics of the agrometeorological conditions in 1954 and 195 in different crops; a discussion of the dynamics of soil moisture (illus. by complex cross sections t 140 cm depth in relation to temperature of air and precipitation for various crops in 1954 (April 20 Oct. 1 and March 10–Sept. 1, 1955) and corresponding tabular data; a discussion with extensive data on evaporation in relation to crop and soil moisture conditions and, finally, integrated curves of evaporation in various crops for 1954 and 1955, respectively, and similar curves of transpiration from crops in relation to precipitation, air temperature, wind speed, moisture deficit are included. All of these elements are summarized by decades, months and seasons for each crop and interpreted in terms of water supply for crops as grown in dry steppe regions. Great diversity in evaporation

ound between crops and at different times in the vegetative season and under different meteorological conditions. However, evaporation from soil under the crop cover in all grain fields was almost the same as in fallow strips. *Subject Headings:* **1. Evaporation from crops 2. Transpiration of crops 3. Dubovka Hydrological Experiment Station 4. Evaporation from steppes 5. Soil moisture-evaporation relationships 6. Dubovka, U.S.S.R. 7. Sal Steppe, U.S.S.R.**—*M.R.*

10J–22 551.501:551.573(47)

Konstantinov, A. R. and Kharchenko, K. I., **Otsenka ispariaemosti v raïone Sal'skikh stepeĭ.** [Evaluation of evaporability in the region of the Sal steppes.] *Leningrad. Gosudarstvennyĭ Gidrologicheskiĭ Institut, Trudy*, 57(111):73–85, **1956.** 7 figs., 2 tables, 28 refs. **DWB**—Meteorological elements used in computing potential evaporation, and actual evaporation from water and land surfaces were measured in the Sal steppe region in 1952–1955. It is found that evaporation from a water surface significantly differs from evaporation from a wet ground surface, and therefore the former cannot serve as a basis for determining irrigation needs. A graph is presented, showing the dependence of evaporation on the size of the evaporating surface. It was found that the reduction coefficient does not depend on size only, but is affected by meteorological conditions and therefore has local applicability. Magnitudes of evaporation from water surfaces determined by different methods are at variance with each other by as much as 50% or more. In determining evaporation from farm fields different methods also give different results. In lysimeters the raising of the ground water level increases evaporation; the lowest evaporation occurs with natural moisture supply. *Subject Headings:* **1. Evaporation computation methods 2. Evaporation from steppes 3. Sal Steppe, U.S.S.R.**—*From Ref. Zhur., Geofizika*, 1229, 1958.

10J–23 551.577.38:551.579.5:551.573(52)

*Kusakabe, M. (*Fukuoka District Central Met. Obs.*), **Drought at Fukuoka, from the viewpoint of potential evapotranspiration.** *Journal of Agricultural Meteorology*, Tokyo, 12(2):69–72, Oct. **1956.** 6 tables, 3 refs. In Japanese, English summary p. 72. **DWB**—Some agrometeorological investigations on drought were made from the viewpoint of precipitation, but the most important factor which influences drought damage is the soil moisture storage of the field. The author estimated the potential evapotranspiration from the monthly mean temperature, and calculated the water balance at Fukuoka. Some results of the calculation are shown in Table 1. Water deficiency occurs in June, July, August and Sept., and it does not occur in the other months. The amount of precipitation has the greatest influence on water deficiency, and the effect of potential evapotranspiration is not so great. The effect of soil moisture storage of the previous month is not negligible. August is the most dangerous month of drought, in the 66 years studied; July is next. Water deficiency is recognized in 16 years and in another 19 years the soil moisture storage decreases for want of precipitation. Table 6 shows the drought damage in Fukuoka Prefecture, and the soil moisture storage and water deficiency at Fukuoka. Generally speaking, water deficiency is useful as the index of drought, but it does not correspond exactly because (1) water requirement of a plant differs with its growth stage and (2) calculation of water balance was made from monthly data. (*Same item as* 10.5–303, May 1959, *MAB.*) *Subject Headings:* **1. Drought periods 2. Soil moisture deficiency 3. Potential evapotranspiration 4. Fukuoka, Japan.**—*Author's abstract.*

10J–24 551.501.4:551.573:631.4

Lowry, William P. (*Dept. of Met., Univ. of Wisconsin, Madison*), **Evaporation from forest soils near Donner Summit, California and a proposed field method for estimating evaporation.** *Ecology*, Durham, N. C., 37(3):419–430, July **1956.** 16 figs. (incl. photos), 2 tables, 11 refs., 10 eqs. **DWB, DLC**—Two standard field methods for approximating evaporation (rates) based on the vapor pressure deficit concept have been reviewed and applied to data collected in several kinds of environments near Donner Summit, Calif. The reliability of the methods at high altitudes compares with results reported in other areas. A mathematical extension of the vapor pressure deficit equation is developed, leading to a much simplified method of making field approximations. If a soil-filled pan is placed level with the soil surface and weighed periodically to obtain a measure of evaporation, and a hygrograph giving a continuous humidity record is placed beside the pan, it is shown that the area under the humidity trace on the chart and between the beginning and ending times of the observation period yields a straight line relationship when plotted on log-log graph paper against the evaporation measured for the same period. (*Same item as* 9.11–111, Sept. 1958, *MAB.*) *Subject Headings:* **1. Evaporation calculations 2. Evaporation from forest soils 3. Donner Summit, Calif.**—*Author's summary, I.L.D.*

10J–25 551.573:551.511:634.9

Mondrillo, George, **Thermodynamics of transpiration in heavy forest during active snow melt.** *Western Snow Conference, 1956, Proceedings*, 24:20–25, Oct. **1956.** tables, 6 refs. **DWB** (M06

W527p)—The thermodynamic relationships involved in forest transpiration in snow-covered area during non-advective weather are analyzed using data from the 1949 melt season (May 9–13) in th Willamette Basin Snow Laboratory and assuming that net advection, net basin energy exchange and net moisture-content change of air and soil are nil. The energy used for transpiration is com puted as the difference between the net all-wave energy exchange with space and the energy requir for melting snow. The transpiration loss is found to consume about 50% of the net input energ to the basin, amounting to an average of 0.14 in./day (about 10% of melt) for the period investigate Condensation water undergoes a repeated cycle of evaporation and condensation, aiding the tra spiration process by supplying water to vegetation and aiding melt by returning some of the tot transpiration energy of the snow. Data on the magnitude of the processes involved in the tra spiration loss, including melt components, are tabulated: *Subject Headings:* **1. Transpiration forests 2. Thermodynamics of transpiration 3. Willamette Basin, Oregon.**—*SIPRE Abstra SIP* 16434, 1959.

10J–26 551.573:581.1

Morais, José Custódio de (*Dir., Geophys. Inst., Univ. of Coimbra*), **Mesures d'évapotranspiratio à Coimbra.** [Evapotranspiration measurements at Coimbra.] Coimbra, Tipografia de Atlântid **1956.** 7 p. fig., 2 tables, 2 refs. **DWB** (M73 M827me)—Preliminary results of evapotranspiratio measurements made at Coimbra (Oct. 1955–Sept. 1956) are reported. Measurements in containe with earth covered with grass have not yet produced sufficient data; evaporation from bare soil show close correlation with global radiation data. (*Same item as* 9.9–220, Sept. 1958, *MAB.*) *Subje Headings:* **1. Evapotranspiration measurements 2. Coimbra, Portugal.**—*G.T.*

10J–27 551.501.4:551.573(471.

*Niinivaara, K., **Evaporation from small catchment areas in Finland.** *Geophysica*, Helsink 5(2):78–94, **1956.** 11 figs., 3 tables, 7 refs., 2 eqs. **DLC**—A detailed analysis is made of the hydr logical balance (soil moisture, precipitation, runoff and evaporation) of two small basins in Finlan (Latosuonoja and Huhtisuonoja at 28°38′ to 42′E and 61°22′ to 24′N) from 1935–47, during th May/June, July/Aug. and Sept./Oct. periods, respectively. Since soil is saturated in May/June an Sept./Oct. the runoff can be considered as equal to $P-E$ (soil moisture does not vary from year year in spring and fall). For the July and Aug. values, a more sophisticated formula is used, en bracing the saturation deficit $(P=A+E+(R_A-B_A)+(R_E-B_E)$ where (R_A-B_A) is the depletio of storage in soil by runoff, and (R_E-B_E) by evaporation. (*Same item as* 8.5–134, May 195 *MAB.*) *Subject Headings:* **1. Evaporation calculations 2. Water balance of small basins 3. Fi land.**—*M.R.*

10J–28 551.573:551.501

Palmer, W. C. and A. V. Havens (*U. S. W. B., Off. of Climatology, Suitland, Md.*), **Graphic method for the determination of evapotranspiration adapted from the Thornthwaite method.** Pr pared for the Weather Bureau short course in Agricultural Meteorology, July **1956.** 3 shee 35×47 cm. 2 charts. **DWB** (M73 U587g)—Nomograms and instructions for their use in clim tology are presented. (*Same item as* 9.5–206, May 1958, *MAB.*) *Subject Headings:* **1. Evap transpiration nomograms 2. Thornthwaite's method.**—*M.R.*

10J–29 551.573:551.579.5:631

Penman, H. L., **The movement and availability of soil water.** *Soils and Fertilizers*, Farnha Royal, 19(3):221–225, June **1956.** 2 tables, 6 refs. **DLC**—Distinguishes between potential (pro erties at a point) and quantity (properties associated with a volume) of soil water. Flux = potenti gradient × conductivity but there is no general mathematical theory of soil-water movement. Ava ability for transpiration is the ratio of actual to potential transpiration rate, available water is th difference between field capacity and permanent wilting point. The experiments of F. J. VEI MEYER and C. H. M. VAN BAVEL on availability and PENMAN on soil moisture deficit are summarize (*Same item as* 8.2–211, Feb. 1957, *MAB.*) *Subject Heading:* **1. Soil moisture availability.**—*C.E.P.*

10J–30 551.573:581.

Pierce, L. T. (*State Climatologist, Columbus, Ohio*), **Estimating evapotranspiration and availab moisture from temperature and rainfall.** *U. S. Weather Bureau, Weekly Weather and Crop Bulleti* 43(18):7–8, April 30, **1956.** 3 figs., 5 refs. **DWB, DLC**—Data show a comparison of measured an computed evapotranspiration from corn, and from a first year meadow. Potential evapotranspiratio appears as a zigzag horizontal line whereas the measured evapotranspiration expresses an almo even rise diagonally. *Subject Headings:* **1. Evapotranspiration estimation 2. Potential evap transpiration.**—*N.N.*

10J–31 551.573:631.67

Rider, N. E., **Water loss from various cropped surfaces.** *Great Britain. Meteorological Research Committee, M.R.P.*, 972, April 20, **1956.** 9 p. 5 figs., 3 tables, 10 refs., eqs. Mimeo. **DWB**—Potential evapotranspiration was calculated by PENMAN'S aerodynamic method for fields of bare soil, pasture, peas and Brussels sprouts near Cambridge, Eng. Apparatus is described and set-up illustrated; observation heights were 25 cm apart. Calculated water loss from peas and sprouts averaged nearly 10 times that from grass; that from soil was still less. The ratios varied from day to day but the differences are real. (*Same item as* 8.2–212, Feb. 1957, *MAB.*) *Subject Headings:* **1. Potential evapotranspiration 2. Irrigation requirements.**—*C.E.P.B.*

10J–32 551.508.72:551.573:631.67

*Robertson, George W. (*Met., Central Experimental Farm, Ottawa*), **Estimating irrigation water requirements from meteorological data.** (In: Ontario Irrigation Conference, Ontario Agricultural College, Guelph, Feb. 1956, **Proceedings,** pub. April **1956.** p. 1–7. 2 tables, 5 refs.) Also Robertson, George W. and Holmes, R. M., **Estimating irrigation water requirements from meteorological data.** Ottawa, Experimental Farms Service, Canada. Dept. of Agriculture, **1956.** 19 p. 9 tables, 17 refs. **DA?**—The potential evapotranspiration is assumed to be proportional to the evaporation of a black Bellani plate atmometer. The available soil moisture is computed for an amount of rain, transpiration and surplus. Supplemental irrigation of 1″ is recommended whenever the soil moisture deficit reaches 1½″. A day-to-day account was made by computing machines for 24 yrs at Ottawa and the normal requirements are summarized. Using monthly averages, the results would be distorted. In the article by ROLERTSON and HOLMES, in addition to a general discussion of soil moisture, daily water use and evapotranspiration (with tables showing supplemental irrigation requirements for Ottawa), a daily soil moisture and irrigation budget for Ottawa for Aug. 1955 is included and discussed. (*Same item as* 9.4–177, April 1958, *MAB.*) *Subject Headings:* **1. Potential evapotranspiration 2. Irrigation requirements 3. Bellani evaporimeter 4. Ottawa, Canada.**—*A.A., M.R.*

10J–33 551.579:551.501.4:551.573

*Romanov, V. V., **Gidrofizicheskie metody rascheta vodnogo balansa bolot.** [A hydrodynamic method for calculating the water balance of swamps.] *Pochvovedenie,* Moscow, No. 8:49–56, Aug. **1956.** 5 tables, eqs. **DLC**—In order to investigate the hydrology of swamps by avoiding the use of long period hydrometeorological observations, the author suggests the investigation of evaporation from the surface of swamps. Evaporation is studied by analyzing the heat balance of selected swamps in White Russian Polesie and in Esthonia during the period 1951–1953. Evaporation was calculated by the formula $U=\alpha R+C$, where U = evaporation in mm/hr; R = radiational balance of an active surface in cal/hr/cm²; α = constant; C = flow from a given part of the swamp. It was found that evaporation is directly proportional to the radiation balance and that the coefficient of proportionality depends upon moisture supply of the evaporating region and upon the developmental stage of the plants. The result of calculations of water balance for oligotrophic swamps, evaporation from dry swamps, monthly evaporation from swamps and from swamps under field crop, etc. are presented. The application of the values of evaporation and water balance to extensive swamp areas is discussed. A formula for expressing penetration through turf is presented. (*Same item as* 9.8–235, Aug. 1958, *MAB.*) *Subject Headings:* **1. Water balance of swamps 2. Evaporation calculations 3. Hydrologic cycle.**—*I.L.D.*

10J–34 551.501:551.573:631.4

Romanova, E. N., **Summarnoe isparenie s razlichnykh pochv v raĭone izbytochnogo uvlazhneniia.** [Evapotranspiration from various soils in a region of excessive moisture.] *Meteorologiia i Gidrologiia,* No. 11:35–37, Nov. **1956.** fig., 2 tables, 4 refs., eq. **DWB, DLC.** English translation available Special Libraries Association Translation Center (John Crerar Library, Chicago) as its R-3640. Transl. also available at **DWB** (M73.R969to)—The evaporation from the grass cover of soils, from drained peat bogs and from the grass cover of clayey dry soil was measured. The observations were made during June–July 1954 on three plots: over land drained in 1950 with height of grass 30–50 cm; over land of older drainage and grass height 40–90 cm; and over clayery dry land with a grass cover of 30–70 cm in height. Evaporation was computed by the method of radiation balance with the aid of the formula

$$\epsilon=\frac{R-B}{1+0.64\,\frac{\Delta t}{\Delta e}}$$

ϵ = evaporation, R = radiation balance (cal/cm²/min), Δt = difference between temperature at 0.5 and 1.5 m, Δe = difference of absolute humidity at these heights (in mb). Data on the daily variation

of evaporation at the three points and on the mean and maximum total evaporation per day are presented. Evaporation from soils of drained peat bogs exceeds evaporation from dry clayey soils of valleys. *Subject Headings:* **1. Evapotranspiration from soil 2. Evaporation measurement techniques.**—*I.L.D.*

10J–35 551.501:551.57

Serra, Louis, **Le contrôle hydrologique d'un bassin versant.** [Hydrological computations for a catchment basin.] Reprint from *I.U.G.G. Association of Scientific Hydrology, Publication*, No. 38:349–357, (1956?). 2 figs., eqs. **DWB**—Discusses a general approach to the hydrologic balance. THORNTHWAITE'S elaborate equations can be represented in a simple form. The annual potential evapotranspiration is proportional to the maximum vapor pressure, based upon annual temperature. A method to compute monthly evaporation is shown. An approach to compute infiltration and runoff is proposed. *Subject Headings:* **1. Hydrologic cycle 2. Potential evapotranspiration 3. Thornthwaite's method.**—*A.A.*

10J–36 551.573:581.11:016

†Stocker, O., **Die Abhängigkeit der Transpiration von den Umweltfaktoren.** [Relationship of transpiration to environmental factors.] *Handbuch der Pflanzenphysiologie*, Berlin, Vol. 3:436–488. **1956.** 67 figs., 4 tables, bibliog. p. 484–488. **DLC** (QK711.R83)—A major review of transpiration-environment relations, with scores of empirical graphs and data in tables, plus an extensive bibliography. The author takes up in systematic manner: (I) transpiration of single plants, diurnal variations of transpiration and evaporation under optimum conditions, under conditions when water is limited and when temperature, humidity, light, insolation or wind are limiting factors; and annual (seasonal) variation, order of magnitude of transpiration; (II) transpiration from tree tops and (III) transpiration in plant stands (the stand coefficient and orders of magnitude of stand transpiration). *Subject Headings:* **1. Transpiration-evaporation relationships 2. Transpiration and environment 3. Evapotranspiration bibliographies.**—*M.R.*

10J–37 551.588.6:551.573

Thornthwaite, Charles W., **Modification of rural microclimates.** (In: International Symposium on Man's Role in Changing the Face of the Earth, Princeton, N. J., June 1955, **Proceedings,** ed. by W. L. Thomas, Jr. Univ. of Chicago Press, **1956.** p. 567–583. 5 figs., 22 refs.) **DLC** (G56.I63)—A general discussion of climatic change since the Pleistocene is followed by a detailed critical examination of the concepts that cultivation of the soil and vegetation increase atmospheric moisture and hence precipitation, and the fallacy of the Soviet program of preventing aridity by forest cultivation. The author then considers the possibility of changing the microclimate by changing the water balance with particular reference to the employment of Thornthwaite's concept of potential evapotranspiration, techniques of water budget of the soil, and work of the Laboratory of Climatology in southern New Jersey. *Subject Headings:* **1. Climatic amelioration 2. Potential evapotranspiration.**—*I.L.D.*

10J–38 551.501:551.573

Thornthwaite, C. W., **The air as a water absorbing medium.** *Handbuch der Pflanzenphysiologie*, Berlin, Vol. 3:257–264, **1956.** 2 tables, 11 refs., 2 eqs. **DLC** (QK711.R83)—A "handbook" type review of the general principles of evaporation and condensation, formulas for evaporation, and methods of measurement (atmometer, mass exchange, energy balance). DALTON'S equation, saturation deficit of air, temperature-humidity relationships at water surface and psychrometer difference, are discussed. *Subject Headings:* **1. Evaporation measurements 2. Evapotranspiration measurement techniques.**—*M.R.*

10J–39 551.501.4:551.573

Uhlig, Siegfried, **Berechnung monatlicher Mittelwerte der Gebietsverdunstung nach einer Methode von Kalweit.** [Calculation of the monthly means of areal evaporation according to the Kalweit method.] *Germany. Deutscher Wetterdienst, Mitteilungen*, 15(3):**1956.** 29 p. 7 figs., 15 tables, 15 refs. **DWB**—The author discusses the concepts of latent, potential and actual evaporation and critically analyzes the equations of Kalweit for calculating monthly means of areal evaporation, using monthly means of saturation deficit, monthly total precipitation, monthly total runoff and monthly mean of useable water storage for North Germany. These equations also include variables taking into account topographic features and a term for reducing potential to actual evaporation. Tables containing for the various stations, the monthly values of the individual terms of the equations, the values of topographic factors, the calculated actual and potential evaporation, etc. are presented. It was found that the results of the evaporation calculations are unsatisfactory, since the term for deducing potential actual evaporation depends solely upon mean annual precipitation so that there is no justification for including the factors for runoff and soil moisture supply in the

expression for the reduction term. (*Same item as* 9.3–144, March 1958, *MAB.*) *Subject Headings:* **1. Evaporation calculations 2. Areal evaporation 3. Kalweit method 4. N. Germany.**—*I.L.D.*

10J–40 551.579.5:631.67 551.573:551.501.6

Van Bavel, C. H. M., **Estimating soil moisture conditions and time for irrigation with the evapotranspiration method.** *U. S. Dept. of Agriculture. Agricultural Research Service, ARS*, 41-11, Aug. **1956.** 16 p. tables, eqs. **DWB** (M79.5 V218e)—A method is described whereby the need for irrigation is determined from an initial state of maximum soil moisture, modified daily by the amount of precipitation and evapotranspiration. A nomogram is presented for computing evapotranspiration from extraterrestrial radiation (constant for month and latitude), sunshine duration and air temperature. (*Same item as* 9.7–86, July 1958, *MAB.*) *Subject Headings:* **1. Soil moisture estimation 2. Evapotranspiration nomograms 3. Irrigation requirements.**—*G.T.*

10J–41 551.579:551.573

*van Hylckama, T. E. A., **The water balance of the earth.** Drexel Institute of Technology. Lab. of Climatology, Contract Nonr-1617(00), Technical Report, No. 2; Publications in Climatology, 9(2):59–116, **1956.** 14 figs., 21 tables, 58 refs. **DWB** (M8 D777p)—The annual cycle of evapotranspiration according to THORNTHWAITE and the resulting water balance is computed for 14,000 locations all over the world, and the resulting water retention in 10° squares computed for all land areas of the earth. It is shown that the greatest amount of water is retained by the continents in April ($.75 \times 10^{19}$ g more than in Sept./Oct.), confirming MUNK'S estimation that the greatest amount of storage occurs in the oceans in Sept.–Oct. (excess Oct.–March $.5 \times 10^{19}$ g.). Regional variations and differences between the N. and S. Hemisphere retention regimes are also shown. The storage in air is ignored—storage in vegetation is shown to be relatively insignificant. Monthly charts with data entered thereon are presented for Eastern and Western Hemispheres, respectively. Certain specific regions are treated in fuller detail to show techniques employed. (*Same item as* 9.7–18, July 1958, *MAB.*) *Subject Headings:* **1. Water balance of earth 2. Evapotranspiration regime of land masses 3. Continents. I. Munk, Walter.**—*M.R.*

10J–42 551.573:581.11

Wilcox, J. C. (*Experimental Farm, Summerland, B. C.*), **Correlation of meteorological data with consumptive use of water by plants.** *Canadian Society of Agronomy, 2nd Annual Meeting, Univ. of Toronto, June 25–28, 1956, Proceedings*, Sec. C, p. 39–51. [Pub. **1956.**] 5 figs., 2 tables, 16 refs.—Problems of evapotranspiration are discussed and two major methods of determining consumptive use outlined: one, the meteorological method (PENMAN, THORNTHWAITE and others), and the other the use of soil moisture blocks, tensiometers or tanks. Various methods of soil moisture measurement, determination of drainage rate and effect on irrigation, etc. are discussed and illustrated graphically. Rates of consumptive use are shown in table based on two plots. (*Same item as* 9.11–231, Nov. 1958, *MAB.*) *Subject Headings:* **1. Evapotranspiration estimation 2. Irrigation effectiveness 3. Water consumption of plants.**—*M.R.*

10J–43 551.573

Zubenok, L. I. and D'iachenko, L. N., **Isparenie v raĭonakh osvoeniia tselinnykh i zalezhnykh zemel'.** [Evaporation in areas of reclaimed virgin and waste land.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 66(128):54–60, **1955.** 6 figs., table, 10 refs., 9 eqs. **DWB**—Methods of calculating evaporation from land surfaces are discussed and BUDYKO'S method of evaporation determination by simultaneous computation of the heat and moisture balance is described. In using this method, climatological data on humidity, temperature and precipitation, as well as runoff and radiation balance values were used. Monthly charts and annual variations of evaporation in regions of virgin and waste lands are presented. Characteristic features of evaporation in these regions during the growing season (April–Sept.) are indicated. The preparation of charts makes it possible to determine the mean total evaporation from the active surface during a specified period. *Subject Headings:* **1. Evaporation from land surfaces 2. Budyko's method.**—*Ref. Zhur., Geofizika*, 7350, 1957.

10J–44 551.521:551.573

Zubenok, L. I. and D'iachenko, L. N., **Isparenie s poverkhnosti Evropeĭskoĭ chasti SSSR.** [Surface evaporation in European Russia.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 66(128):61–67, **1956.** 7 figs., table, 6 refs., 4 eqs. **DWB**—Monthly charts and annual variations of evaporation in European U.S.S.R. obtained by the method described in the preceding paper are examined. It is shown that evaporation values increase from north to south in accordance with the increase in radiation balance, if there is sufficient moisture supply, as is the case in the north. In southern regions, the soil moisture amount assumes a significant role, thus disrupting the latitudinal effect on evaporation. In the west evaporation is higher than in the east. The highest values

are observed in the Ukraine (over 45 cm a year), the lowest ones in the Transvolga and Lower Volga regions (less than 20 cm a year). Deviations of monthly and annual values from long-period values may amount to 100%. Anomalies of evaporation are in fair agreement with those of the radiation balance. *Subject Headings:* **1. Evaporation from land surfaces 2. Radiation balance effects on evaporation 3. European U.S.S.R.**—*Ref. Zhur., Geofizika*, 8195, 1957.

1957

10J–45 551.573(79

Blaney, Harry F., **Evaporation and evapotranspiration studies United States Department of Agriculture in the Pacific Southwest.** (In: I.U.G.G. Association of Scientific Hydrology, **Symposia Darcy, Dijon, Sept. 1956, (Proceedings)**, Vol. 1, pub. **1957.** p. 21–25. 4 tables, 3 refs.) **DWI** (M79 I61sym)—Irrigated agriculture in western U. S. is discussed. The studies and activities of the Department of Agriculture in the Pacific Southwest areas include the investigations of evaporation at high altitudes, in desert areas, and the evaporation and evapotranspiration in San Francisco Bay. Computed monthly data on these aspects are presented in the report. *Subject Headings:* **1. Evapotranspiration 2. San Francisco Bay area, Calif. 3. Southwest U. S.**—*N.N.*

10J–46 551.573:551.577.52:634.9

Bleasdale, A., **Afforestation of catchment areas: the physicist's approach to problems of water loss from vegetation.** *Empire Forestry Review*, 36(1):59–66, **1957.** 19 refs. **DA**—Much literature is discussed, especially by J. GRUNOW and H. L. PENMAN. Loss of water by interception-evaporation is largely or entirely compensated by fog-drip from trees. Afforestation also provides best control over surface runoff and erosion on heavy soils. Penman's aerodynamic and heat balance methods of estimating evaporation are discussed. Planting of trees introduces factors that dark green foliage will absorb more of incoming radiation than a lighter green, and individual trees and plantations destroy assumption of a smooth level surface. Effect of wind breaks is also discussed. (*Same item as* 8.11–203, Nov. 1957, *MAB.*) *Subject Headings:* **1. Forest influences 2. Water losses from vegetation.**—*C.E.P.B.*

10J–47 551.573:551.579.5

Chiang, P. H., **La météorologie et la réserve d'eau dans le sol.** [Meteorology and ground water reserve.] *Meteorological Bulletin*, Taipei, Formosa, 3(4):1–4, Dec. **1957.** 2 figs., table. In Chinese; French summary p. 1. **DLC** (Orientalia)—On the basis of the formula $P=R+E$ a study is made of all meteorological factors affecting R and E, with the purpose of solving the problem of ground water reserve. Potential evapotranspiration is calculated according to THORNTHWAITE's method in order to illustrate the properties of ground water reserve and its applications to agriculture. *Subject Headings:* **1. Ground water resources 2. Potential evapotranspiration calculations.**—*Transl. of author's abstract.*

10J–48 551.573:581.11

*Drinkwater, W. O. and Janes, B. E. (*both, Univ. of Connecticut*), **Relation of potential evapotranspiration to environment and kind of plant.** *American Geophysical Union, Transactions* 38(4):524–528, Aug. **1957.** 2 figs., 2 tables, 20 refs. **Discussion** by Kohler, M. A. and Foster, Edgar E. and **Reply** by Drinkwater and Janes, *Ibid.*, 39(5):972–974, Oct. **1958.** table, 5 refs., eqs. **DWB, DLC**—The purpose of this investigation was to establish relationships between potential evapotranspiration and several elements of weather, potential evapotranspiration as influenced by the surroundings and irrigation of the surroundings, and potential evapotranspiration of Kentucky bluegrass, sweet corn and celery. High correlations were found between measured potential evapotranspiration (PE) of bluegrass and open-pan evaporation, atmometer evaporation, average temperature, solar radiation, and duration of sunshine when data were grouped into between-rain periods. When the same data were grouped into seven-day periods, relatively low correlations were obtained. Uniform surroundings, watered daily, were found to reduce measured PE of bluegrass 23.2% below bluegrass in non-uniform surroundings which were not watered. Measured PE exceeded evapotranspiration computed by the Thornthwaite empirical formula by 10 to 70% and appeared more closely associated with amount of rainfall than with mean temperature. Water use by sweet corn was found to be 22.2% higher than use by bluegrass. Although the surrounding area of celery was watered each day, PE was 11.0% greater than that of bluegrass, the surrounding area of which was not watered. When compared with PE of bluegrass which received daily irrigation of surroundings, water use by celery was 36.8% greater. (*Same item as* 9.3–210, March 1958, *MAB.*) *Subject Headings:* **1. Potential evapotranspiration 2. Evapotranspiration-crop relationships.**—*Authors' abstract.*

10J–49 551.509.59:551.579.4

Dvizin, V. A., **Sostavlenie prognozov urovneĭ vody v period napolneniia Kakhovskogo vodokhranilishcha.** [Preparation of water-level forecasts for the recharge period of the Kakhovka

reservoir.] *Meteorologiia i Gidrologiia*, Leningrad, No. 3:56–57, March **1957.** fig. **DWB, DLC**—At first the expected volume of water of the reservoir was computed and then from the curve of volume the water level was obtained. In the case of daily forecast of expected volume $w = w_0 + \Delta w$ where w_0 = daily volume of reservoir when the forecast is made. Δw expected variation of volume in 24 hours, $\Delta w = (Q_3 - Q)86400 - u$. Q_3 discharge of water at Zaporozhe taking into account arrival at the reservoir. Q = total discharge through the spillways, filtration through the main structures, discharge of water through sluices into turbines, u = total (m^3) of evaporation from surface of reservoir and from the open part of the river etc. The time of flow of the water discharge from Zaporozhe to the dam of the Kakhovka Hydroelectric station was obtained from the time of arrival of the water at the open portion of the river (t_1) and the time of arrival of water to the Kakhovka reservoir (t_2). The calculation of water level from total volume is illustrated with specific examples. *Subject Headings:* **1. Reservoir water level forecasting 2. Kakhovka, U.S.S.R.**—*I.L.D.*

10J–50 551.571.1:551.585.55:551.555.3(47)

Dzerdzeevskiĭ, B. L., **Meteorologicheskaia kharakteristika prizemnogo sloia vozdukha nad uvlazhnennymi i sukhimi uchastkami Zavolzhskoĭ stepi.** [Meteorological characteristics of the air layer near the ground over moistened and dry plots in the Transvolga Steppe.] (In: Akademiia Nauk SSSR. Institut Geografii, **Sukhovei, ikh proiskhozhdenie i bor'ba s nimi.** Moscow, **1957.** p. 168–188. 14 figs., 8 tables, 7 refs., 3 eqs.) **DLC** (QC940.R9A6)—This is a generalization of some results of moisture-balance and micro-climatic observations carried out by a field group of the Institute of Geography of the U.S.S.R. Academy of Sciences in summer 1952. It has been shown that it is possible to obtain an almost complete elimination of the noxious effects of dry-wind weather on vegetation on very large areas of land by means of organizing small, but closely located, irrigated plots, alternating with natural small ponds. *Subject Headings:* **1. Moisture balance over steppes 2. Steppe microclimates 3. Dry winds 4. Transvolga Steppe, U.S.S.R.**—*A.M.P.*

10J–51 551.573:551.521:634.9

*†Fedorov, S. F., **Isparenie v usloviiakh lesa.** [Evaporation in forests.] *Leningrad. Gosudarstvennyĭ Gidrologicheskiĭ Institut, Trudy*, 59:74–133, **1957.** 23 figs., 32 tables, charts, 62 refs. **DWB**—Evaporation and transpiration was experimentally investigated in various types of forests in the Valdai region in 1953–1956. Measurements were made by means of hydraulic evaporators loaded with potted trees (birch, pine, fir) and by means of GII500-50 evaporators with soil covered with pine-fir and brushwood-like growth. Simultaneous observations were made of air temperature, precipitation, ground water level, soil temperature and phenological data. The thermal and moisture regimes in the evaporators were compared with those in the natural plots. Results are presented in extensive tables and graphs and discussed in detail. Average total evaporation and transpiration in the forest for 1955–56 was 370 and 175 mm respectively, total evaporation from a field was 425–440 mm. *Subject Headings:* **1. Evaporation from forests 2. Radiation effects on evaporation 3. Valdai Uplands, U.S.S.R.**—*G.T.* (*Based on Ref. Zhur. Geofiz.* 3792, 1959.)

10J–52 551.573(431.5)

Friedrich, W. (*Bundesanstalt für Gewässerkunde, Koblenz, Germany*), **Methodology of evaporation research in Germany: present status and future tasks.** (In: I.U.G.G. Association of Scientific Hydrology, **Symposia Darcy, Dijon, Sept. 1956, (Proceedings)**, Vol. 1, pub. **1957?** p. 26–29.) **DWB** (M79 I61sym)—Research is being undertaken to establish the extent of evaporation in the German Federal Republic. Lysimeter measurement of evaporation has been used because of the better meteorological results. About 450 mm out of the 771 mm of Germany's natural water supply has been recorded lost annually by evaporation. Hydrological measurements and lysimetric observations are preferred for the determination of the actual evaporation from soil and vegetation. *Subject Headings:* **1. Evaporation research 2. West Germany.**—*N.N.*

10J–53 551.579:551.573(431.5)

Friedrich, W., **Zur Methode der Ermittlung der Gebietsverdunstung.** [Determination of regional evapotranspiration.] *Die Wasserwirtschaft*, Stuttgart, 47(5):123–125, Feb. **1957.** 5 refs., 2 eqs. **DLC**—Paper does not go beyond statement about regional evapotranspiration, stresses the need for more lysimeter data and lists some of the more important papers on the subject. Average annual precipitation in West Germany is 771 mm; 450 mm are lost by evapotranspiration. *Subject Headings:* **1. Evapotranspiration 2. Hydrologic cycle 3. West Germany.**—*A.A.*

10J–54 551.555.3:551.573

Gal'tsov, A. P., **Izmeneniia ispariaemosti kak pokazatel' protsessa obrazovaniia sukhoveia.** [Variations in evaporability as an indicator of the process of formation of dry wind.] (In: Akademiia Nauk SSSR. Institut Geografii, **Sukhovei, ikh proiskhozhdenie i bor'ba s nimi.** Moscow, **1957.** p. 199–211. 8 figs., 3 tables, 5 refs., 2 eqs.) **DLC** (QC940.R9A6)—A theoretical paper in which the

author examines successively the problems of 1. the physical essence of the effect of dry wind o plants; 2. calculation of the heat balance components according to data of standard meteorologic observations; 3. values of saturation and evaporability saturation deficiency as indicators of th tension of external factors of transpiration; 4. The role of wind in the formation of "sukhovei weather; 5. the role of changes of insolation and of air temperature in the interdecadal variations o evaporability. *Subject Headings:* **1. Sukhovei 2. Synoptic conditions for dry winds 3. Hea balance-dry wind correlations 4. Evapotranspiration.**—*A.M.P.*

10J–55 551.573(419.6

*Guerrini, V. H., **An analysis of evapotranspiration observations at Valentia Observatory Au 1952–July 1956.** *Eire. Meteorological Service, Technical Note*, No. 25, July **1957.** 20 p. 2 figs 2 tables, 9 refs. **DWB, DLC**—Monthly values of PE observed at Valentia (1952–56) tabulated an compared graphically and in tables and on a regression chart with computed values, using the Penma and Thornthwaite formulas, respectively, and with runoff in the Shannon River. Appended a 5 and 10 day means of PE, maximum temp., wind speed, relative humidity, sunshine and daily mea temp., and monthly means of these elements and of vapor pressure, plus normals for 1921–50 fo most elements. PENMAN'S formula gives a better fit in winter—THORNTHWAITE'S is not bad i summer. Advection of warm air in winter from Atlantic, when growth is at a standstill owing t little insolation is reason for poor fit of THORNTHWAITE'S formula (based on temp.) Maximu temp. gives best correlation of parameters tested. (*Same item as* 8.11–6, Nov. 1957, *MAB.*) *Subje Headings:* **1. Evapotranspiration 2. Valentia, Ireland.**—*M.R.*

10J–56 551.573:581.1

†Halstead, Maurice H. and Covey, Winton, **Some meteorological aspects of evapotranspiration** *Soil Science Society of America, Proceedings*, 21(5):461–464, Sept./Oct. **1957.** fig., 19 refs., 10 eq **DWB.** Reprinted in *Texas A. and M. College. Dept. of Oceanog. and Met., Contributions in Ocea ography and Meteorology*, 3(60–89):217–220. Issued **1958. DWB**—During the past decade in creasing attention has been given to various engineering type equations designed to estimate, fro available climatic data, the amount of water used by plants. Some of the basic assumptions in volved in these equations are examined in the light of recent advances in knowledge of the physica processes at the earth-atmosphere interface. It is found that the majority of equations involvin the concept of potential evapotranspiration or consumptive use tend to assume a homogeneous so moisture regime infinite in horizontal extent. Therefore, it has been difficult to apply these equation to irrigation practice, which obviously must create isolated areas of above normal moisture. Con sequently, the problem is approached from the strictly physical point of view, and it is shown that solution can be obtained, provided that sufficient knowledge of soil interactions is available. *Subje Headings:* **1. Evapotranspiration 2. Water consumption of plants.**—*Authors' abstract.*

10J–57 551.57

*Ivanov, Nikolaĭ Nikolaevich, **Mirovaia karta ispariaemosti.** [World evaporation chart.] Leningrad, Gidrometeoizdat, **1957.** 3 tables, 16 refs. **DLC** (QC878.I85)—The explanatory pam phlet (750 copies published) which accompanies the world "evaporability" chart goes into the physica theory and practical significance of evaporability, explains the map in detail (and how it was con structed), and goes into the various peculiarities of the evaporation regime in the U.S.S.R., Wester Europe, Asia (outside U.S.S.R.), Australia and the East Indies, Africa, North America, and Sout America. Annual potential evaporation ranges from <250 mm in the extreme Arctic and cold pol to >5250 mm in the heart of the Sahara. Great variations occur on the same continents and eve in the same climatic "zones." For example, in Death Valley, Calif. it exceeds 3700 mm, and on th California Coast <375 mm, and in the Cascades <250 mm. The world chart, on a 1:65,000,00 scale, was compiled by reduction of a 1:4 to 1:15 million chart on which data from 2700 points wer plotted. Monthly totals were used in obtaining the annual values (in mm), and a comparison made between results, using the author's formula and those of DAVYDOV (1944), ZAIKOV (1949), an BRASLOVSKIĬ (1954). At 9 coastal points the author's values differed <3% from the average of th others, and at 9 interior points not >5%. The mean latitudinal evaporation by 5° parallels in continental areas from 0 to 80°N and 0 to 55°S is given in a table, and the same for 16 "natural zones (snow and ice, tundra, forest tundra, taiga, podzol, forest-steppe, etc.) on 5 continental area are tabulated. (*Same item as* 10.7–47, July 1959, *MAB.*) *Subject Headings:* **1. Evaporability chan of world 2. Potential evaporation charts.**—*M.R.*

10J–58 551.573(474.5

Kasperavichene, G. I., **K voprosu o raspredelenii uvlazhneniia po territorii Litovskoĭ SSR.** [O the distribution of moisture in Lithuanian SSR.] *Lietuvos TSR Mokslų Akademija. Geologijos i Geografijos Institutas, Mokslinial Pranešimai*, 5:137–142, **1957.** English summary. 5 figs., 4 refs **DWB**—The average monthly values of some climatological data, including the relative moisture

ate of evaporation, coefficient of moisture, and expenditure of heat, are discussed with regard to their erritorial distribution in Lithuanian S.S.R. in warm period of the year. *Subject Headings:* **1. Moisture distribution 2. Lithuanian S.S.R.**—*Author's abstract.*

10J–59 551.571:551.573(234.3)

Kasser, P. (*Labs. recherches hydrauliques mécanique terres à l'EPF, Zürich*), **Sur l'indice d'évaporation du bassin versant Alpin de Mattmark.** [Evaporation index of the Alpine Mattmark basin.] In: I.U.G.G. Association of Scientific Hydrology, **Symposia Darcy, Dijon, Sept. 1956, (Proceedings),** Vol. 1, pub. **1957?** p. 15–17. 19 refs. English summary p. 16.) **DWB** (M79 I61sym)—During 1932 to 1946 the water balance in the 39½% glaciated basin of Mattmark (Swiss Alps), an area of 15.25 km², has been determined. A mean annual precipitation of 1914 mm, a runoff of 1628 mm and a total loss of 58 mm of glaciated water has been recorded. Thus the evapotranspiration stands at 344 mm. The mean elevation of the area is 2850 m and the mean annual temperature −3°C. This is higher than would be expected. *Subject Headings:* **1. Water balance of Alpine basins 2. Evaporation index 3. Swiss Alps.**—*N.N.*

10J–60 551.573:581.11

King, K. M. (*Ontario Agr. Coll., Guelph, Ont.*), **Effects of soil, plant and meteorological factors on evapotranspiration.** *Royal Meteorological Society. Canadian Branch,* [*Publication*], 8(4), Nov. 28, **1957.** 10 p. 3 figs., 16 refs. **DWB**—A general discussion of the heat and water budget of crops (evapotranspiration, soil, plant and meteorological factors affecting crops). The supply of heat at the evaporating surface and the availability of water at the evaporating surface are the two main factors influencing evapotranspiration. The heat and moisture budget of a crop-soil-air system is shown on a schematic diagram, and 2 nomograms show (1) relation of sensible heat flux to evapotranspiration from a cotton crop and (2) the change with time of water stored in a soil with and without vegetative cover. (*Same item as* 10.5–286, May 1959, *MAB.*) *Subject Heading:* **1. Evapotranspiration.**—*M.R.*

10J–61 551.573:551.451

Kozlov, M. P., **Sutochnyĭ khod summarnogo isparenііa s luga i ego sviaz' s meteorologicheskimi faktorami.** [Diurnal variations of evapotranspiration from meadows and its relation to meteorological factors.] *Leningrad. Gosudarstvennyĭ Gidrologicheskiĭ Institut, Trudy,* 59:134–171, **1957.** 18 figs., 13 tables, 25 refs., 2 eqs. **DWB**—Investigations of evapotranspiration from a meadow were carried out by means of a hydraulic evaporator at the Valdai scientific research laboratory during the summer months (May–Sept.) of 1951–1955. The instrument gives a record of evapotranspiration for certain time intervals with an accuracy of 0.1–0.05 mm. An analysis of the data shows the diurnal variations of evapotranspiration; it starts ½ to 1 hour after sunrise and ends ½–0 h before sunset, reaching its maximum at 12–13 h; transpiration represents a significant portion of it. After mowing the character of diurnal variation is preserved but the intensity decreases. A comparison with evaporation in other climatic regions and with other types of plant cover shows full agreement of the regularities observed if there is adequate soil moisture supply. Evapotranspiration is compared with meteorological elements and a close correlation is found with global radiation, with a correlation coefficient of 0.95. The significant values in the variations of evaporation do not depend on temperature, although there is an overall correlation with atmospheric temperature. No correlation has been established with absolute atmospheric humidity, but correlations exist with moisture deficit and relative humidity. Precipitation and cloudiness sharply reduce evapotranspiration. The correlation coefficient between hourly evaporation values and wind speed is about 0.80. Global radiation is the basic factor determining the daily variations of evaporation in a region of sufficient evaporation. *Subject Headings:* **1. Evaporation from meadows 2. Diurnal evaporation variations.**—*Ref. Zhur., Geofizika, 3793, 1959.*

10J–62 551.573:551.501.4(492)

†*Kramer, C., **Berekening van de gemiddelde grootte van de verdamping voor verschillende delen van Nederland volgens de methode van Penman.** [Computation of the mean value of evaporation for various parts of the Netherlands according to Penman's method.] *Netherlands. Meteorologisch Instituut, Mededelingen en Verhandelingen,* No. 70, **1957.** 85 p. 15 figs., 25 tables, 22 refs., 8 eqs. English summary p. 66. **DWB, DLC**—The contents of this comprehensive and thorough investigation of evaporation in the Netherlands by means of PENMAN'S method are as follows: a brief summary of research on evaporation in the Netherlands, an exposition of PENMAN'S method for computing evaporation including the theoretical bases, and the development of the formulas; the choice of the stations for which evaporation computations were made, the distribution of the stations with special reference to maritime, continental, and intermediate climatic regions; the characteristics and treatment of the principal meteorological data employed in the computation of evaporation, namely,

atmospheric temperature, relative humidity, sunshine percentage and wind velocity; regiona differences in evaporation from year to year for the period 1933–1953; annual variation of evapora tion; comparison of calculations made with PENMAN's method with those obtained with evaporatic measured from floating pans and with those measured by means of Piche evaporimeters and a seri of remarks on derivation of PENMAN's formula consisting of neglecting the element S (namely warm ing of the water by the underlying surface), magnitude of the factor $K/E=\beta$ (Bowen's ratio), an the exchange of long wave radiation between the atmosphere and the water surface. The monthl normal values of evaporation show a large annual variation for many stations, with all statio having the maximum of evaporation in June and the minimum in December. Evaporation, abso lutely as well as relatively, is greatest along the coast and in the southern part of Limburg. Hen "the pattern of evaporation over the Netherlands is roughly composed of the wind pattern and th temperature pattern." The results obtained with the PENMAN method are in good agreement wit evaporation measurements from floating pans in the Yselmeer from May to end of September, wit the Piche evaporimeter the Penman figures are in good agreement for April to end of Septembe in poor agreement for March, October and November. The experimental results are presented i tables. *Subject Headings:* **1. Evaporation data 2. Penman's evaporation formula 3. Netherland** —*I.L.D.*

10J–63 551.577:551.573(52

Kusakabe, M. (*Fukuoka District Met. Obs.*), **Effective precipitation at Fukuoka from the view point of potential evapo-transpiration.** *Journal of Agricultural Meteorology*, Tokyo, 12(4):151–15 March **1957.** 2 figs., 5 tables, 4 refs. In Japanese; English summary p. 154. **DWB**—The auth estimated the potential evapotranspiration from the observed air temperature, and calculated th water balance at Fukuoka. We can suppose that the amount of water surplus which was obtain above calculation is the amount of effective precipitation. Monthly amount of effective precipitatio and fluctuation of effective precipitation (1890–1955) are shown in tables. The amount of effectiv precipitation is the function of the amount of actual precipitation, evapotranspiration and so moisture storage. The relation between the amount of effective precipitation and actual precipit tion is the most closely evident as shown in Table 3 and Fig. 1. When the monthly totals of precipit tion and evapotranspiration of two months are the same, while their daily amounts are differen the monthly amount of effective precipitation should be different. But we should not greatly e if we assume the monthly calculated data as the actual amount of effective precipitation. Th difference between the monthly data and the total of the daily data is shown in Table 4. Table and Fig. 2 show the relation between monthly data and total of daily data. (*Same item as* 10.4–26 April 1959, *MAB.*) *Subject Headings:* **1. Effective precipitation 2. Potential evapotranspiratio 3. Water budget calculations 4. Fukuoka, Japan.**—*From author's abstract.*

10J–64 551.579.5:551.573(52

Kusakabe, M. (*Fukuoka District Met. Obs.*), **Soil moisture storage at Fukuoka, from the view point of potential evapo-transpiration.** *Journal of Agricultural Meteorology*, Tokyo, 13(2):56–5 Oct. **1957.** 3 figs., 2 tables, 3 refs. In Japanese; English summary p. 58. **DWB**—The auth estimated the soil moisture storage from the observed air temperature and amount of precipitatio at Fukuoka. Monthly amount of soil moisture storage is tabulated (1890–1955). Graphical da are included on seasonal variation of soil moisture storage (1926–1955), mean value and standar deviation of daily storage, soil moisture expectancy and range of soil moisture storage which occu in the given expectancies. *Subject Headings:* **1. Soil moisture storage 2. Evapotranspiratio 3. Fukuoka, Japan.**—*Author's abstract.*

10J–65 551.573:551.579(522.

Kusakabe, M., **Water balance at Fukuoka.** *Journal of Meteorological Research*, Tokyo, 9(7 455–462, July **1957.** 3 figs., 9 tables. In Japanese: English summary p. 455. **DWB, DLC**—Fro the viewpoint of hydrometeorology, it is essential to study the water balance; namely, we must i vestigate not only the amount of precipitation but also the rate of evapotranspiration and so moisture storage. C. W. THORNTHWAITE suggested the conception of potential evapotranspiratio Adopting this conception, we can estimate the rate of evapotranspiration and explain the wat balance. Table 1 shows the water balance at Fukuoka (top: average of 66 yrs, 1890–1955, midd 1939, drought year, bottom: 1941, rainy year). The mean and fluctuation of the monthly rate potential evapotranspiration, amount of precipitation, change of soil moisture storage, soil moistu storage, actual evaporation, water surplus and water deficiency (1890–1955) are shown in Tables 2– Fig. 2 and 3 show the frequency distribution of the rate of potential evapotranspiration and th amount of precipitation. The relation between the amount of precipitation and water surplus a shown in Table 9 and Fig. 3. (*Same item as* 9.7–240, July 1958, *MAB.*) *Subject Headings:* **1. Wat balance 2. Evapotranspiration 3. Fukuoka, Japan.**—*Author's abstract.*

10J–66 551.588.6:551.579

Lády, Géza, **Az erdők és a víznyelő erdősávok hidrometeorológiai vonatkozásai.** [Hydrometeorological aspects of forests and water-absorbing forest belts.] *Időjárás*, Budapest, 61(2):126–134, March/April **1957.** 2 tables, 14 refs. German summary p. 126. **DLC**—Various forest influences upon the hydrologic cycle are discussed in general terms, e.g., "horizontal precipitation" (the combing of clouds by forests near the top of high mountains) which can yield up to three times the amount of ordinary precipitation in certain locations (but not under conditions prevailing in Hungary), reduction of runoff, reduction of evaporation, and water losses by transpiration. Problems upon which future research should concentrate are suggested. *Subject Headings:* **1. Forest influences on water regime 2. Hydrologic cycle.**—*G.T.*

10J–67 551.573:551.577.52:634.9

Laurie, M. V., **The effect of forests in water catchment areas on the water losses by evaporation and transpiration.** *Empire Forestry Review*, 36(1):55–58, **1957.** 7 refs. Also Bleasdale, A., **Afforestation of catchment areas: the physicist's approach to problems of water loss from vegetation** *Ibid.*, p. 59–66. 19 refs. **DA**—In the first paper factors influencing transpiration from different types of vegetation, and economics of runoff are discussed. In the second paper much literature is reviewed, especially by J. GRUNOW and H. L. PENMAN. Loss of water by interception-evaporation is largely or entirely compensated by fog-drip from trees. PENMAN'S aerodynamic and heat balance methods of estimating evaporation are discussed. Planting of trees introduces factors that dark green foliage will absorb more of incoming radiation than a lighter green, and individual trees and plantations destroy assumption of a smooth level surface. Effect of wind breaks is also discussed. (*Same item as* 8.11–203 and –205, Nov. 1957, *MAB.*) *Subject Headings:* **1. Forest hydrology 2. Water losses from vegetation.**—*C.E.P.B.*

10J–68 551.573(73)

Linsley, Ray K.; Blaney, Harry F.; Harbeck Earl G. and Kohler, Max A., **Research on evaporation and evapotranspiration in the United States.** (In: I.U.G.G. Association of Scientific Hydrology, **Symposia Darcy, Dijon, Sept. 1956, (Proceedings)**, Vol. 1, pub. **1957?** p. 18–20. 14 refs.) **DWB** (M79 I61sym)—A joint research project sponsored by the U. S. Bureau of Reclamation, Geological Survey, Navy and Weather Bureau at Lake Hefner, Okla. is discussed. This research on evaporation in the U. S. has received extended studies in eastern and western states. Efforts in individual areas are reported. *Subject Headings:* **1. Evapotranspiration research 2. United States.**—*N.N.*

10J–69 551.573:551.579

Makkink, G. F. (*Cent. Inst. Agr. Res. Wageningen, Netherlands*), **The application of research on evaporation in hydrology.** (In: I.U.G.G. Association of Scientific Hydrology, **Symposia Darcy, Dijon, Sept. 1956, (Proceedings)**, Vol. 1, pub. **1957?** p. 12–14. 40 refs.) **DWB** (M79 I61sym)—The author discusses the yield of water from a hydrological point of view as a phenomenon based on precipitation and evapotranspiration and how these are further interdependent on climate and weather, and the type of surface, respectively. Different ways of determining evaporation and evapotranspiration are discussed. *Subject Heading:* **1. Evaporation-hydrology relationships.**—*N.N.*

10J–70 551.521:551.573

Michalowsky, Johannes, **Strahlungsbilanz und Landesverdunstung.** [Radiation balance and evaporation rate.] *Annalen der Meteorologie*, 8(1/2):7–10, **1957.** fig., 2 tables, 9 refs. English summary p. 10. **DWB**—At Quickborn correlation between daily radiation balance at earth's surface and evaporation, April–Oct. 1954, ranged from 0.76 to 0.95. By contrast correlation between saturation deficit and evaporation was only 0.04–0.51. No correlation could be found between wind velocity and evaporation. On rainy days relation between sensible and latent heat was negligible, and nearly all radiation balance was used for evaporation. On rainless days nearly half sensible heat went to warm the atmosphere. This result cannot be applied to the sea where heat transfer is governed by vertical and horizontal temperature gradients. (*Same item as* 9.1–199, Jan. 1958, *MAB.*) *Subject Headings:* **1. Radiation balance 2. Evaporation 3. Quickborn, Germany.**—*C.E.P.B.*

10J–71 551.573:551.501.9(794)

*Muckel, Dean C., **Evaporation investigations in the San Francisco Bay Region, California.** First Progress Report to the Corps of Engineers, U. S. Army Office of the District Engineering, San Francisco District. Berkeley, Calif., U. S. Agricultural Research Service, Soil and Water Conservation Research Branch, Western Soil and Water Management Section, Nov. 1, **1955.** 22 p. 5 figs. (incl. photos), 20 tables, 7 refs. Also: **Second Progress Report,** Nov. 1, **1956.** 21 p. 8 figs., numerous tables. Also: **Third Progress Report,** Dec. **1957.** 32 p. 7 figs., numerous tables. **DWB** (M73 U581pr)—These three annual reports give detailed data and description of equipment at 8

evaporation stations operating on a 5-year program by the U. S. Corps of Engineers in the San Francisco Bay Region for the purpose of obtaining accurate estimates of consumption of water by vegetation and from open water surfaces. Three of the stations were taken over from the California State Division of Water Resources. Seventeen other stations in the area are equipped with Weather Bureau type evaporating pans. Experiments are also included for comparison of evaporation from tule swamp vegetation, and from open water or pans, and for comparing pan evaporation with that from black and white atmometers. The first annual report gives a description of the climate of the San Francisco Bay area and of the project, past records of stations, etc., with photographs of sites and a map showing location of the 24 stations (station was closed). Reports for the 2nd and 3rd years give extensive data on wind, temperature, precipitation, evaporation from weather bureau pan, atmometers and other types of gauges for each station where applicable. The relationship between evaporation from different types of equipment are shown graphically. Close correlation was found between losses from Livingston atmometers and consumptive use of water by plants at Davis, Calif. and at other places. Close correlation was also found between difference of water loss by black and white bulb and solar radiation (Eppley pyrheliometer), and also between black-white atmometer evaporation and evaporation from tule at Joice Island, Calif. Evaporation records (by months) for several stations for period 1922–1955 are included (Davis and Newark). Estimates are given of total evaporation losses behind proposed barriers (for various barrier plans) for the excessively dry year 1930–31. Actual measured evaporation varies from 105″ at Tracy Pumping Plant to 53″ at Richmond Field Station. Comparisons are made at several locations in some areas to obtain coefficients for use of data from main stations. *Subject Headings:* **1. Evaporation network 2. Evaporimeter comparisons 3. Swamp evaporation 4. San Francisco Bay Area.**—*M.R.*

10J–72 551.586:551.573:633.

Pfeifer, F., **Untersuchungen über die Transpirationsintensität von Erbsen (Pisum sativum) mittels einer registrierenden Schwimmwaage.** [Investigations of transpiration rate of peas (*Pisum sativum*) by a recording floating balance.] *Angewandte Meteorologie*, 2(12):374–381, May **1957**. 11 figs., 14 refs. **DWB**. Also summary in: *Umschau*, Frankfurt a.M., 59(11):343–344, June 1 **1959**. 2 figs. **DLC**—The transpiration of a small stand of peas under different weather conditions was measured with a floating lysimeter. The transpirograms compared with time of day and weather showed a spontaneous reaction to changes of wind velocity, relative humidity, evaporation and sunshine. Nocturnal transpiration was unexpectedly high, exceeding dew formation on cool summer nights. The greatest variations in transpiration intensity occurred with passage of fronts, especially cold fronts. *Subject Headings:* **1. Transpiration of peas 2. Lysimeters.**—*C.E.P.B.*

10J–73 551.573:551.577:551.524

Reichel, E. (*Munich*), **Der Zusammenhang zwischen Niederschlag, Temperatur und Verdunstung in den Alpen.** [Relation between precipitation, temperature and evaporation in the Alps.] *La Météorologie*, Paris, Ser. 4, No. 45/46:199–205, Jan./June **1957.** tables, 8 refs. German, French and English summaries p. 199. **DWB**—Evaporation is considered—according to WUNDT'S process—as depending upon precipitation and temperature. In the Alps not very homogeneous precipitation and streamflow values give an uncertain basis for the evaporation which is their difference. However it is possible to demonstrate that evaporation in the Alps is 80 to 130 mm higher than the global average for the same yearly precipitation and temperature values. It is assumed that the most important reason for that is the accumulation of snow. The "foehn" and meadow irrigation might also play a part. In conclusion, an evaporation of 600 to 700 mm at 600 m and of 550 to 650 mm at 1000 m altitude is found in the Alps, provided that sufficient precipitation (over 1175 mm, respectively, 1050 mm) is available. (*Same item as* 9.4–176, April 1958, *MAB.*) *Subject Headings:* **1. Evaporation-precipitation-temperature relationships 2. Evaporation in high mountains 3. Alps.**—*Author's abstract.*

10J–74 551.573:551.586:633.2/3(425.9)

*Rider, N. E., **Water losses from various land surfaces.** *Royal Meteorological Society, Quarterly Journal*, 83(356):181–193, April **1957.** 4 figs., 4 tables, 2 eqs. **DWB**—The aerodynamic method of calculating daily water losses from peas, grass and Brussels sprouts was used near Cambridge, Eng., May–July 1955. Thermo-electric dry- and wet-bulbs were read at 2 heights 25 cm apart (set-up shown) and wind speeds at 5 heights. The differences in the water losses from various surfaces were too large to be accidental; on sunny days they were: peas 2.5–7.5 mm, grass 2–3 mm, Brussels sprouts about 4 mm, with no steady relation between them or loss from bare soil. (*Same item as* 8.8–263, Aug. 1957, *MAB.*) *Subject Headings:* **1. Evapotranspiration estimation 2. Cambridge, Eng.**—*C.E.P.B.*

10J–75 551.573(47)

Rogov, Mikhail M., **Gidrologiia del'ty Amu-Dar'i: geografo-gidrologicheskaia kharakteristika.** [Hydrology of the Amu Darya delta: geographic hydrological characteristics.] Leningrad, Gidro-

metizdat., **1957.** 253 p. 86 figs., 55 tables, 184 refs. **DLC** (1356.A5R6)—A chapter on the water balance of the Amu Darya Delta region (p. 137–145) contains tables on monthly amounts of evaporation from free and growth-covered water surfaces, transpiration by reed, wind speed, and differences between moisture deficit and absolute humidity in reed and over an open lake. (For abstract on the whole book *see* 10.1–22, Jan. 1959, *MAB.*) *Subject Headings:* **1. Hydrology of Amu Darya delta 2. Evapotranspiration from marshes 3. Amu Darya, Kara Kalpak A.S.S.R.**—*G.T.*

10J–76 551.573:551.457

*†Romanov, V. V., **Isparenie s neosushennykh i osushennykh bolot.** [Evaporation from drained and undrained swamps.] *Leningrad. Gosudarstvennyĭ Gidrologicheskiĭ Institut, Trudy*, No. 60:20–42, **1957.** 2 figs., 8 tables, 18 refs., 3 eqs. Also his: **Opredelenie isspareniia s osushennykh i neosushennykh bolot metodom teplovogo balansa.** [Determination of evaporation from drained and undrained swamps by means of the heat balance method.] (In: U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby, **Materialy konferentsii po agrometeorologii i agroklimatologii Ukrainskoĭ SSR.** Leningrad, **1958.** p. 193–201. 2 figs., 4 tables, 9 refs., 6 eqs.) **DWB**—The evaporation formula $u=\alpha R_b+C$ (u = evaporation; R_b = radiation balance of the surface of a swamp; α = empirical coefficient and C = a term which depends upon conditions of micro- and macroadvection, and which can be neglected when evaporation is measured over a long period). The coefficient α diminishes sharply at the end of the vegetation period and during the period of development of the leaf surface. The values of α for undrained and drained upland and lowland swamps, and its variation during the vegetation period were determined for different parts of the U.S.S.R. Evaporation was computed both for upland and lowland marshes for a series of maps on the scale of 1:1,000,000. The evaporation of lowland swamps was computed either by means of α, attained in the lowland swamps of Polesie or from the values of evaporation of upland swamps and corresponding evaporation of sphagnum-shrub microlandscape and transitional lowland margins of upland swamps. The difference between these methods varied from 2 to 13.7%. The magnitude of evaporation from upland swamps decreased from southwest to northeast. The decrease was more gradual than the diminution of evaporation from dried river beds. On the southwest border of the zone of oligotrophic swamps the evaporation from swamps and dried river beds is almost equal, while on the northern boundary evaporation from the former is more, 1.22–1.60 greater than from the latter. Both the southern and northern boundaries of a zone are determined by precipitation during the vegetation period equal to the evaporation from upland swamps. Evaporation from lowland swamps also decreases from southwest to northeast. The maximum runoff normals from upland swamps are observed in elevated regions (Ural Range) but in the plain they are observed in the middle of a zone. Draining of upland swamps brings about a considerable decrease in evaporation and correspondingly an increase in runoff normals of 1.3–1.5 times. Evaporation from drained and cultivated lowland swamps depends upon the nature of the crop, level of agricultural technology, sowing, etc. Data on monthly evaporation from undrained swamps and drained swamps under summer crop cultivation, evaporation rates from undrained and drained swamps, etc., are presented. Most of the data in the second article are the same as in the first, but the arrangement is different. *Subject Headings:* **1. Evaporation from swamps 2. Evaporation data 3. Polesie, U.S.S.R.**—*I.L.D. and author's conclusion.*

10J–77 551.573:551.556

Romanov, V. V., **K voprosu o roli vetra v protsesse isspareniia s bolot.** [The role of wind in the process of evaporation from swamps.] *Leningrad. Gosudarstvennyĭ Gidrologicheskiĭ Institut, Trudy*, No. 60:77–85, **1957.** 2 figs., table, 4 refs., 9 eqs. **DWB**—With reference to the equation of heat balance, the author discusses the problem of whether evaporation or turbulent heat flow into the atmosphere is of primary importance or whether they are equally important and cites evidence that evaporation is primary and only in the case of limited evaporation of insufficient moisture does turbulent heat exchange play a role. It is also shown that the coefficient of turbulent mixing depends both upon turbulent heat exchange with the atmosphere and evaporation intensity. Using the equation of heat balance $S_R+S_L=\epsilon_c+Q_F+Ak\Delta T+Bk\Delta e$ and k as computed from

$$k_T=x^2z\sqrt{\frac{(\Delta u)^2}{\left(\ln\frac{z_2}{z_1}\right)^2}+\frac{\alpha zg}{\gamma T_a}\frac{\Delta T+\eta\Delta e}{\ln\frac{z_4}{z_3}}}$$

a series of computations of evaporation were carried out. It is shown that the role of unstable air, caused by the moisture gradient during turbulent exchange, is very important and its neglect leads to false conclusions, that wind may increase evaporation somewhat only when the solar radiation is intense and air temperature is low. Under ordinary weather conditions the wind effect is slight and cannot be detected by present methods of evaporation measurement. The effect of wind upon α (an experimental coefficient of proportionality between evaporation and radiation balance as a function of moisture supply and phase of plant development) in the equation $u=\alpha R_b$ is insignificant and may

be neglected. The equation $u = \alpha R_b + c$ expresses the fundamental law of the balance process and can be used for computing evaporation in different swamp zones. *Subject Headings:* **1. Evaporation from swamps 2. Wind effects on evaporation.**—*I.L.D.*

10J–78 551.573:551.577.38(47)

Savina, S. S., **Defitsit ispareniia, kak pokazatel' zasukhi.** [The deficit of evaporation as an index of drought.] *Lietuvos TSR Mokslų Akademija. Geologijos ir Geografijos Institutas, Mokslinia Pranešimai*, 5:143–152, **1957.** 5 figs., table, 12 refs., 6 eqs. **DWB**—In the article it is proposed to use as an index of drought the so called evaporation deficit which equals the rate of evaporation minus the actual evaporation. The advantage of this method has been shown by applying it to the region of wood-steppe and of steppe zone in the European part of R.S.F.S.R. *Subject Headings:* **1. Evaporation deficit 2. Drought indexes 3. European U.S.S.R.**—*Author's abstract.*

10J–79 551.57

Savina, S. S., **Sviaz' mezhdu ispareniem i ispariaemost'iu pri dostatochnom uvlazhnenii pochvy** [Relation between evaporation and potential evaporation with adequate soil moisture.] *Meteorologiia i Gidrologiia*, Leningrad, No. 10:28–30, Oct. **1957.** fig., table, 7 refs., 3 eqs. **DWB, DL0**—Using the method of heat balance, the author attempts to verify experimentally the assumed fact that, with adequate soil moisture, evaporation and potential evaporation from a plant cover are identical. The evaporation rate is obtained from the equation $E = \frac{(R-B)\Delta e}{0.64\Delta t + \Delta e}$, and potential evaporation from a plant cover by $E_0 = \rho D(\beta e_0 - e)$. By incorporating the latter equation into the radiation balance equation, the latter is solvent so that e_0 and e are determined: D, the coefficient of exchange is determined from $D = cu$ where c is the coefficient of proportionality and u, wind velocity; β is the product of two factors, a which is the mean relative humidity of the air at the boundary of the plant cover and γ which appears in the nonlinear relationship between maximum tension of water vapor and air temperature. A table giving values of c and β, and a graph showing the relationship of evaporation and potential evaporation are presented. In the presence of adequate soil moisture these two quantities are equal on a range of 0.1 to 0.125 mm/hour. Also the parameter β is independent of meteorological conditions in determining potential evaporation. (*Same item a*: 10.3–277, March 1959, *MAB.*) *Subject Headings:* **1. Evaporation from plant cover 2. Potential evapotranspiration.**—*I.L.D.*

10J–80 551.573:631.67(47)

Seriakova, L. P., **Opredelenie ispariaemosti i raschety norm orosheniia.** [Determination of potential evaporation and calculations of irrigation rates.] *Akademiia Nauk SSSR, Ser. Geogr.*, No. 6:112–117, **1957.** 5 figs., 1 table, 4 refs., eqs. **DWB**—By means of M. I. Budyko's equations for computing potential evaporation from the earth's surface, the author computed the geographical distribution of evapotranspiration for the arid and semi-arid regions of the U.S.S.R. During the entire year the latitudinal variation of isolines of potential evaporation is in general maintained. During the winter potential evaporation does not exceed 10 mm/month in moisture deficit regions except the southern areas of the Sea of Aral, and the shores of the Black and Caspian Seas. The maximum potential evaporation is in July. In the case of large irrigated regions where air masses coming from deserts are transformed so that their moisture content is increased and their temperature is lowered the potential evaporation is less than that of small irrigated areas. Since under conditions of continuous supply of water and nutrient substances meteorological factors play the dominant role in total transpiration of plants and evaporation from the soil, the total water requirement of plants for any interval can be determined approximately by estimating the total potential evaporation for the interval. The difference between evaporation and potential evaporation indicates the amount of irrigation to be supplied to a field in order to provide optimum conditions for plant development. A correction must be made for water losses in the irrigation network. In the case of spring wheat the climatic norm of irrigation may be 1.5–2 times less than the actual norm. It is shown that for spring wheat the climatic norm of irrigation should provide optimum (above 70% of field capacity) soil moisture. The maximum norms of irrigation are found in regions with greatest potential evaporation. Also the determination of irrigation norms for cotton is discussed. The climatic norm of irrigation is the average characteristics of moisture deficit and it varies with the meteorological condition of a given year. The norm of irrigation should be determined according to potential evaporation for individual years since the latter varies considerably from year to year. *Subject Headings:* **1. Potential evapotranspiration in arid regions 2. Irrigation requirements 3. U.S.S.R.**—*I.L.D.*

10J–81 551.579.5:551.573:581.11

†Shanbhag, G. Y. (*M. J. College, Jalgaon*), **Some notes on evapo-transpiration, evaporation from soil and transpiration.** *Indian Journal of Meteorology and Geophysics*, Delhi, 8(2):127–136, April

957. 38 refs. **DWB, DLC**—General remarks on various aspects and processes of evaporation from soil and plants, soil moisture, evapotranspiration, physical and biological factors, etc. It is concluded that transpiration removes more water in a unit time from the soil, since it works simultaneously on the whole volume of soil occupied by the roots. (*Same item as* 10.2–261, Feb. 1959, *MAB.*) *Subject Headings:* **1. Evaporation from soil 2. Evapotranspiration.**—*M.R.*

10J–82 551.501:551.573

Sibbons, J. L. H. (*Univ. of Sheffield*), **The climatic approach to potential evapotranspiration.** *Advancement of Science*, London, 13(52):354–356, March **1957.** 4 refs. **DLC**—PENMAN'S method, the most soundly based and accurate of those developed so far for calculating potential moisture loss, is discussed in a modified form involving SUTTON'S vapor transfer equation. The calculations involved are summed up. *Subject Headings:* **1. Potential evapotranspiration 2. Penman's method.**—*W.N.*

10J–83 551.573:551.577.2:551.582.1 (581)

*†Stenz, Edward, **Precipitation, evaporation and aridity in Afghanistan.** *Acta Geophysica Polonica*, Warsaw, 5(4):245–266, **1957.** 2 figs., 9 tables, 21 refs. **DWB, DLC**—After a brief history of the organization of the Afghanistan Weather Service and a listing of the various weather stations in Afghanistan including their coordinates, the author analyzes the precipitation, evaporation and aridity in Afghanistan using observations made in Afghanistan, adjacent Indian data and other published data. The article contains a discussion of (1) the geographical distribution and temporal variation of precipitation in Afghanistan, data being presented on the mean monthly and mean annual precipitation, number of rain days, diurnal maximum of precipitation (Kabul), frequency of thunderstorms (Kabul) and number of days with snow precipitation; (2) of mean monthly and mean annual potential evaporation as determined by the WILD evaporation balance, the geographical and temporal variation of actual evaporation as calculated by a modification of SZYMKIEWICZ'S formula:

$$E = 0.965 \cdot n \frac{760}{B - V} (1 + 0.2 \cdot W)(V - v)^{0.7},$$

and (3) an analysis of the climate of Afghanistan on the basis of its continentality, temperature and precipitation, and aridity as determined by GORCZYŃSKI. *Subject Headings:* **1. Climate of Afghanistan 2. Precipitation distribution 3. Evaporation data 4. Aridity 5. Afghanistan.**—*I.L.D.*

10J–84 551.573:551.501.45

*Thornthwaite, C. W. and Mather, J. R., **Instructions and tables for computing potential evapotranspiration and the water balance.** *Drexel Institute of Technology. Laboratory of Climatology, Publications in Climatology*, 10(3):185–310, **1957**; Contract NONR-1617(00), Technical Report, No. 5. numerous tables. **DWB** (M8 D777p)—This manual contains the tables used at Centerton, N. J. (and applicable to other stations) in computing potential evapotranspiration and other parameters of the water balance, namely (1) monthly values of heat index corresponding to monthly mean temperature, (2) values of unadjusted daily potential evapotranspiration for different mean temperatures, (3) mean possible duration of sunlight and (4) soil moisture retention factor. The values are given for temperatures both in °C and °F. Explanations and examples are included as well as a note by D. B. CARTER on application to regions with multiple wet and dry seasons, with particular attention to the Ivory Coast. *Subject Headings:* **1. Potential evapotranspiration calculation 2. Computation tables. I. Carter, D. B.**—*G.T.*

10J–85 551.501:551.573

Turner, J. A. (*Meteorologist assigned to the British Columbia Forest Service, Victoria, B. C.*), **A nomographic solution for the computation of evaporation.** *Royal Meteorological Society, Canadian Branch (Publication)*, 8(1):40–51, **1957.** 4 figs., 2 tables, 7 refs. **DWB, DLC**—PENMAN'S method for estimating evapotranspiration involves an estimate of evaporation (E_0) that would take place from an extended sheet of water under given climatic conditions, namely

$$E_0 = \frac{\Delta H + 0.27\, E_a}{\Delta + 0.27} \quad \text{mm/day}$$

and a seasonal correction factor (f) applied to convert E_0 to potential evapotranspiration, where

$$E_a = 0.35(e_a - e_d)(1 + U_2 \cdot 10^{-2}) \text{ mm/day}$$

The radiation budget is determined by:

$$H = \frac{Q_E}{59}(1 - r)(0.18 + 0.55\, S) - \sigma \frac{T_a^4}{59}(0.56 - 0.92\sqrt{e_d})(0.10 + 0.90\, S)$$

Four nomograms are presented for computing each of the stages in calculating average daily evaporation.

Nomogram I: $$0.95\,Q = 0.95\,Q_E(0.18 + 0.55\,S)$$

Nomogram Ia: $$0.95\,Q = 0.95\,Q_0(0.355 + 0.68\,S)$$

an alternate empirical equation for Canadian localities;

Nomogram II: $$N = \sigma T_a^4(0.56 - 0.092\sqrt{e_d})(0.10 + 0.90\,S);$$

Nomogram III: $$E_a = 0.35(e_a - e_d)(1 + U_2 \cdot 10^{-2})$$

and Nomogram IV: $$E_0 = \frac{\Delta H + 0.27\,E_a}{\Delta + 0.27}$$

Subject Heading: **1. Penman's evaporation formula.**—*I.L.D.*

10J–86 551.501:551.57

Uhlig, Siegfried (*Bremen*), **Der praktische Wert einer Berechnung der potentiellen Verdunstung** [Practical value of calculating potential evaporation.] *Naturwissenschaftliche Rundschau*, Stuttgart, 10(12):454–458, Dec. **1957.** 6 figs., 7 refs. **DWB, DLC**—The distinction between potential evapotranspiration and actual evaporation is clarified and the methods of PENMAN, THORNTHWAITE and HAUDE to calculate potential evapotranspiration are described briefly. This is followed by an analysis of the potential evaporation and water balance of the Weser-Ems region with the aid of THORNTHWAITE'S method, the calculation of potential evaporation as a basis for estimating the sprinkling need of various landscapes as illustrated by the use of Penman's method for England, the use of potential evaporation as an initial value to compute actual evaporation illustrated by the application of Thornthwaite's method, and soil moisture conditions at Geisenheim during the period 1950–1955. *Subject Headings:* **1. Potential evapotranspiration calculation 2. Potential evaporation 3. Thornthwaite's method.**—*I.L.D.*

10J–87 551.573:01

†Van der Bijl, Willem, **Evapotranspiration problem: first contribution.** *Kansas. State College, Manhattan. Dept. of Physics, Report*, **1956/1957.** 94 p. figs., tables, 46 refs., eqs. **DWB** (M7.K1bre)—A thorough review of the history, literature, methods and data on the subject of evaporation and evapotranspiration, beginning with DALTON'S work in 1802, tabulating frequency of articles on the subject in LIVINGSTON'S (1908–9) excellent bibliography on evaporation (*see* K–1, Nov. 1950 *MAB*) and the one by H. P. KRAMER (1950) (in *MAB*, vol. 1, p. 733–762). Nomograms for determining evaporation and evapotranspiration according to formulas of THORNTHWAITE, RYKOORT, KRAMER method of PENMAN'S formula, and the data computed from these nomograms for Manhattan, Kans.; data for Kansas stations compiled from COCHRANE'S equation, DECKER'S Columbia, Mo., investigations, the 3 German methods of ALBRECHT, HAUDE and KALWEIT; and 3 Russian (Leningrad) methods for coefficient of turbulent diffusion (by IVANOV, SKVORTSOV, and POLIAKOV) are reviewed extensively with illustrative data and development of the equations by the various authors. (*Same item as* 10.2–21, Feb. 1959, *MAB*.) *Subject Headings:* **1. Evapotranspiration nomograms 2. Evaporation research 3. Evaporation bibliographies 4. Manhattan, Kans.**—*M.R.*

1958

10J–88 551.57

Ackermann, William C. (*Illinois State Water Survey*), **Factors that affect the water cycle (1958.)** 16 p. ref. Reproduced from typescript. "Prepared for delivery on program of Section O-Agriculture of the American Association for the Advancement of Science on December 29, 1958."—The factors that affect hydrologic cycle are evaporation, transpiration, atmospheric condensation, topography, soil, precipitation, and human activities. In this report water runoff and the above factors are discussed. *Subject Heading:* **1. Hydrologic cycle.**—*N.N.*

10J–89 551.573:63

Allison, F. E.; Roller, E. M. and Raney, W. A., **Relationship between evapotranspiration and yields of crops grown in lysimeters receiving natural rainfall.** *Agronomy Journal*, Madison, Wisc. 50(9):506–511, Sept. **1958.** 2 figs., 3 tables, 8 refs. **DWB**—Losses of water to the air from cropped lysimeters were greater than from bare soil and were directly correlated with crop yields regardless of crop rotation. Efficiency of water use was favored by high-yielding, well-fertilized crops that

kept the soil constantly covered. *Subject Heading:* **1. Evapotranspiration-crop yield relationships.**—*Authors' abstract.*

10J–90 551.584.4:551.579

Baden, W. and Eggelsmann, R., **Über den Einfluss der Vegetation leistungsfähigen Hochmoorgrünlandes auf den Wasserhaushalt.** [On the influence of the vegetation of highly productive peat lands on the water balance.] *International Union of Geodesy and Geophysics. Association of Scientific Hydrology, Toronto, Sept. 1957,* [*Transactions*], Vol. 2, pub. **1958.** p. 387–396. 7 figs., 11 refs. French summary p. 387. **DWB** (M(06) 1611g)—A seven-year study has been made on the rainfall, soil dampness, the varying levels of underground water, the temperature, evaporation, and the degree of the humidity in the air in the marshy area close to the testing station of Königsmoor. The report reveals that the influence of this highly productive marshy area on the climate of Königsmoor is unfavorable. During the summer, humidity is greatest in the air because of the excessive evaporation that comes through the dense growth. (*Same item as* 10.8–333, Aug. 1959, *MAB.*) *Subject Headings:* **1. Marsh land microclimatology 2. Water balance of marsh land 3. Königsmoor, Germany.**—*N.N.*

10J–91 551.577:551.573:633.1(783)

Basile, Robert M. (*Dept. Geography, Ohio State, Univ. Columbus*), **Climatic variations in South Dakota, 1900–1950.** *South Dakota. Agricultural Experiment Station, Brookings, Agricultural Economics Pamphlet,* No. 96, Sept. **1958.** 17 p. fig., table, numerous charts, foot-refs. **DWB** (M:63 S726a)—Maps of South Dakota for each year 1900–1950 show precipitation adjusted by taking into account the evapotranspiration (P/E index) according to THORNTHWAITE'S classification. Relation of P/E index to corn production and to precipitation in Beadle County, South Dakota is shown in a table of yearly values from 1931–1950 and on a graph. The appendix shows how the P/E index was calculated. *Subject Headings:* **1. Effective precipitation charts 2. P/E Index 3. Corn production 4. South Dakota.**—*M.R.*

10J–92 551.582.2:551.577:551.573(675)

Bultot, F., **Quelques aspects de la climatologie du Bas et du Moyen Congo.** [Some aspects of the climatology of Low- and Middle-Congo.] *Académie Royale des Sciences Coloniales, Bulletin des Séances, n. s.,* 4(2):508–530, **1958.** 21 figs., 2 graphs, 8 tables, 10 refs. **DLC**—This article contains comparative data concerned with rainfall and evaporation in the Inga and Kouilou sites. It is divided into two parts; the former deals with rainfall and the latter with evaporation. In Ch. I, the author mentions the annual and monthly pluviometric depths of these regions. The intense rainfalls, as also the dry and rainy seasons with their dates of beginning and end are likewise considered. Charts and tables summarize the various data concerned with precipitation. Evaporation is, in the first instance, estimated through the energy balance method; it decreases during the dry season on account of a sensible fall of the global incident radiation. The evaporation inter-annual variability, both monthly and annual seems to be rather feeble. This climatic element is, afterwards, valued through Turc's method. Owing to this method, the author is of the opinion that the average annual evaporation for the period 1930–1954, should range about 1000 mm, i.e., much about the same as rainfall. He concludes, moreover, that the amplitude of the average seasonal limnimetric oscillation is near 300 mm. *Subject Headings:* **1. Climate of the Belgian Congo 2. Precipitation, Belgian Congo 3. Evaporation, Belgian Congo 4. Inga, Belgian Congo 5. Kouilou, Belgian Congo.**—*A.V.*

10J–93 551.573:551.577(26.04)

Carter, Douglas B., **The average water balance of the Delaware Basin.** *Drexel Institute of Technology. Lab. of Climatology, Publications in Climatology,* 11(3):249–269, **1958.** 7 figs., 3 tables, 11 refs. (Contract Nonr-1617(00), Technical Report, No. 6.) **DWB** (M8 D777p)—The study is presented as part of a current program to improve empirical procedures for estimating the main topoclimatic effects (slope, site, soil depth and vegetation cover) on the utilization of water balance. The analysis is based on THORNTHWAITE'S concepts, and examples of the revised procedure by THORNTHWAITE and MATHER (1955) are demonstrated in the computations for Milford, Dela. and Roxbury, N. Y. presented in tabular form. Monthly runoff from the Delaware Valley into the bay is based on values at 108 climatological stations and presented on charts. The average water balance of Delaware Bay is governed by (1) evaporation from the bay, (2) precipitation to the bay, (3) basin runoff to bay, and (4) net inflow or outflow between the bay and the Atlantic. There is an average net outflow in every month. *Subject Headings:* **1. Water balance of bays 2. Delaware Bay.**—*W.N.*

10J–94 551.579:551.573:581.11

Closs, R. L. (*Dominion Physical Lab., New Zealand*), **Transpiration from plants with a limited water supply.** *UNESCO, Arid Zone Research,* 11:168–171, pub. **1958.** 2 figs., 2 tables, 5 refs., eqs.

French summary, p. 171. **DWB** (M84 US8cl)—Measurements of transpiration rates from mustar seedlings were made under controlled conditions and their variations as a function of surface tensio of soil moisture were analyzed. Actual transpiration is found to be equal to potential transpiratio until the drying of the soil reaches a pF value of 3.4. After that the actual transpiration decreas linearly as a function of the increase in pF. The author explains this by the fact that transpiratio depends on the surface tension of soil moisture when the pF is larger than 3.4. *Subject Headings:* **1. Transpiration of plants 2. Water supply effect on transpiration.**—*Transl. of author's abstract.*

10J–95 551.573:551.57

Deacon, E. L.; Priestley, C. H. B. and Swinbank, W. C., (*all, Div. of Met. Physics, C.S.I.R.O Melbourne, Australia*). **Evaporation and the water balance.** *UNESCO, Arid Zone Research,* N 10:9–34, **1958.** 207 refs., 28 eqs. **DWB, DLC**—After a brief sketch of the characteristics of rainfa in arid regions, the interception of rainfall by trees, the influence of forests on the water balance an the interrelationships of infiltration penetration and run-off, the authors review critically the mos important aspects of evaporation and water balance with particular reference to the climatologic aspects and to arid regions. The contents of this review include the following: the physics of eva oration comprising a historical review of the scientific study of evaporation since Dalton, evaporatio from tanks and pans, and formulas allowing the quantitative determination of such evaporation, th energy balance method of evaporation measurement, the combination of the energy balance and th Dalton formula, the theoretical and hydrodynamical approach based upon turbulence theory, an the direct measurement of evaporation; validity of various procedures for estimating potentia evapotranspiration such as Thornthwaite's empirical method, and by the Dalton type of equation and the application of potential evapotranspiration to making water budgets for the soil; the at mospheric processes involved in the formation of dew and the role of plants and topography in de formation, the measurement of dew by the flow method, Duvdevani gage, etc.; the role of the hy groscopic action of soil in the water balance of arid zones; the global and regional balance of wat vapor including the determination of moisture transport northward and southward at various lat tudes especially about latitude 30°, the zonal vapor transport in North America, etc., and a revie of the instruments and techniques used in evaporation studies, namely lysimetric soil moistu profile method, aerodynamic method, the eddy correlation method and energy balance approac *Subject Headings:* **1. Evaporation 2. Potential evapotranspiration 3. Hydrologic cycle 4. Ari zones.**—*I.L.D.*

10J–96 551.573(49

Donciu, Constantin, **Evapotranspiraţia in R.P.R.** [Evapotranspiration in Romania.] *M teorologia, Hidrologia şi Gospodarirea Apelor,* Bucharest, 3(1):23–32, **1958.** 6 figs., 3 tables, 9 ref Russian, French and English summaries, p. 23–24. **DWB**—The monthly and annual mean potentia evapotranspiration is computed by Thornthwaite's formula, using data for 112 stations in Romani for the period 1891–1955. A potential evapotranspiration map of Romania shows that the highes values (>700 mm) are in the Danube flood lands and delta; the annual values decrease slightl towards the north of the country but decrease sensibly with altitude (less than 300 mm at 2500 m Mean monthly evapotranspiration is negligible in winter at negative temperatures but increas regularly with temperature until July, when it reaches 150 mm in the Danube flood lands (less tha 100 mm in the mountains). By computing the monthly and annual balance between precipitatio and potential evapotranspiration, the actual evapotranspiration, water deficiency and excess we also determined and are presented in maps. *Subject Headings:* **1. Potential evapotranspiratio 2. Evapotranspiration estimation 3. Romania.**—*From author's abstract.*

10J–97 551.501:551.57

Duginov, V. I., **Resul'taty primeneniia metody turbulentnoĭ diffuzii dlia rascheta isparenii s sel'skokhoziaĭstvennykh poleĭ Kamennoĭ Stepi.** [Results of applying of the method of turbule diffusion for computing evaporation from fields of Kamennaia Steppe.] *Meteorologiia i Gidrologii* Leningrad, No. 3:38–40, March **1958.** 3 tables, 6 refs. **DWB, DLC**—The determination of eva oration from fields was studied by using the method of water balance, method of turbulent diffusio (A. R. Konstantinov) and the weighing method. The results of measurements made during th summers of 1954 and 1955 on two fields in the Kamennaia Steppe are compared. The diffusio method showed a correlation of 0.094±0.027 with the weighing method in the case of the 195 measurements. In the 1955 measurements the results of the diffusion method were also very clo to those obtained by the other two methods. For approximate calculation of evaporation in th Kamennaia Steppe for periods of a month, season or year the graphical method of Poliakov com pares fairly well with those obtained by the weighing method. *Subject Headings:* **1. Evaporation fro land surfaces 2. Water balance method of evaporation calculation 3. Turbulent diffusion metho of evaporation calculation 4. Weighing method of evaporation calculation 5. Kamennaia Step U.S.S.R.**—*I.L.D.*

10J–98 551.579.5:551.588.4(44)

Haillaire, Marc (France), **Le rôle de la végétation dans l'épuisement des réserves d'eau du sol.** [Role of vegetation in the depletion of ground water reserves.] *International Union of Geodesy and Geophysics. Association of Scientific Hydrology, Toronto, Sept. 1957*, [*Transactions*], Vol. 2, pub. 1958. p. 412–422. 7 figs., 2 eqs. **DWB** (M(06) I611g)—A study of ground water level in France shows the effect of soil moisture on the evapotranspiration of any particular area. Factors such as precipitation do affect the climate of the area. Soil moisture has been systematically studied. The results indicate that the amount of water in the soil and the type of such water do affect the vegetational growth in the area. *Subject Headings:* **1. Vegetation effects on ground water storage 2. France.**—*N.N.*

10J–99 551.501:551.573

Haude, Waldemar (*Hannover*), **Über die Verwendung verschiedener Klimafaktoren zur Berechnung potentieller Evaporation und Evapotranspiration.** [The application of different climatic factors to the calculation of potential evaporation and evapotranspiration.] *Meteorologische Rundschau*, Berlin, 11(3):96–99, May/June **1958.** 4 figs., 3 tables. **DWB, DLC**—The climatic factor best suited as the initial value of an empirical formula for calculating potential evaporation and transpiration was determined by means of measurements of evaporation from a moist soil surface or from a plant cover well provided with moisture. The experiments were carried out at the agrometeorological station of Giza near Cairo, Egypt, and evapotranspiration was measured by using the Thornthwaite-Mather tanks. The measurements of evaporation, of air temperature and relative humidity (in a Stevenson screen), of evaporation with a Piche evaporimeter and radiation with an Eppley pyrheliometer are discussed. The determination of whether any of the climatic factors has a value that is either constant or that alters uniformly with time so that when multiplied with the values of the climatic factor there is obtained the approximate value of evaporation is described. For every pentad value the quotient of evaporation/climatic element was computed. Curves showing the variation of these quotients for potential evaporation and evapotranspiration show a break at June or September depending on the particular climatic element; by additional multiplication with constants all the June values were made to coincide. A comparison of measured and computed values of potential evaporation and potential evapotranspiration shows that the element of maximum daily temperature gives the most precise values of evaporation. Data giving mean semimonthly quotients for the various climatic elements, percent frequency of ± deviation of evaporation and evapotranspiration computed with various climatic factors from actual measured values, etc. are presented. *Subject Headings:* **1. Potential evaporation 2. Potential evapotranspiration 3. Evaporation measurements.**—*I.L.D.*

10J–100 551.573:633.15(62)

Haude, Waldemar, **Über den Wasserverbrauch von Mais.** [Water consumption of maize.] *Meteorologische Rundschau*, Berlin, 11(6):179–182, Nov./Dec. **1958.** 2 figs., 3 tables, ref. **DWB, DLC**—The results of an experimental study on the water consumption of maize during the two cultivation periods, April–July and July–August, carried out in Egypt (Giza near Cairo) are analyzed. Modified evapotranspiration tanks were used to measure evaporation and evapotranspiration; to obtain evaporation rate the tank was covered with dead maize plants. Transpiration was computed by subtracting evaporation from evapotranspiration. The mean daily values of evapotranspiration and pure transpiration on a maize field between individual irrigation periods, the potential evaporation of an adjacent grass field, kept continuously wet during the April–August and August–October vegetation periods are represented on graphs. Both periods are compared in respect to the duration of days for each vegetation period; corresponding evaporation, transpiration, days with temperature above 15°C, short wave total radiation in kcal/cm² are given. For the early season growth period the total water consumption was 650 mm; transpiration −350 mm, and waste evaporation 300 mm; for the later period total water consumption was 600 mm, transpiration −350 mm and waste evaporation 200 mm. The spring-summer total short wave radiation was greater than that of the summer-fall period; but the temperature total above 15°C during growth and blossoming was greater in the latter than in the former. The transpiration amounts during growth and blossoming were approximately the same in both periods; the amount of evapotranspiration was greater in all four growth stages during the spring-summer period for an ever increasing radiation amount. *Subject Headings:* **1. Evapotranspiration measurement techniques 2. Transpiration of maize 3. Egypt.**—*I.L.D.*

10J–101 551.571.1:551.573

*†Ivanov, Nikolaĭ Nikolaevich, **Atmosfernoe uvlazhnenie tropicheskikh i sopredel'nykh stran zemnogo shara.** [Atmospheric moisture in tropical and adjacent countries.] Leningrad, Akademiia Nauk SSSR, **1958.** 311 p. 598 figs., 14 maps (fold.), tables, bibliog. p. 165–176. (*Vsesoiuznoe Geograficheskoe Obshchestvo SSSR, Zapiski*, n.s., Vol. 18.) **DLC** (QC915.185). **DWB**

(M71.2 193aT)—An elaborate study (1700 copies) accompanied by extensive tables of climatic dat and large colored folded charts, of the rainfall, evaporation and moisture balance of the tropics, a of individual continental and island regions in the tropics or subtropics (35°N to 35°S). The eig main chapters cover: (1) General laws of distribution of precipitation in warm regions—effects temperature, circulation, relief, ocean currents, vegetative cover, etc. on precipitation regim (2) Annual precipitation regime and types; (3) Amplitude of seasonal variation of precipitatio (4) Potential evaporation; (5) Coefficient of local effective precipitation; (6) Annual moisture regim (7) Moisture balance and (8) Climatic classification according to the annual regime of atmosphe moisture balance. A bibliography of about 400 references to Russian and non-Russian (half a half) literature on precipitation, effective precipitation and evapotranspiration, is included. Tabl for 600 selected stations in all parts of the earth, systematically arranged data for tropics are append along with graphs for nearly 300 selected stations showing seasonal distribution of dry, moist period and other factors of moisture balance. (*Same item as* 10.7–26, July 1959, *MAB.*) *Subject Heading* **1. Moisture balance of tropics 2. Precipitation data for tropics 3. Evaporation charts for tropi 4. Tropics.**—*M.R.*

10J–102 551.501.4:551.57

Ivanov, N. N., **Eshche o formule ispariaemosti.** [More on the evaporation formula.] *Vs soiuznoe Geograficheskoe Obshchestvo, Leningrad, Izvestiia,* 90(1):75–76, Jan./Feb. **1958.** 3 table 8 refs. **DLC**—The usefulness of the potential evaporation formula of IVANOV $E_m = 0.0018(25+T)^2 \times (100-a)$ and the abbreviated formula $E_m = 18.4D$ where E_m = potential evaporation in a month mm, and D = saturation deficit in mm, are compared. The results of comparative measuremen with these formulae show that at mean monthly air temperatures of +10° to +15°C the comple formula yields results 20–30% higher, but at temperature of 35 to 40°C it yields results 17–25% lower than the abbreviated formula; that the variations of relative humidity within the given limi do not influence the results of the complete and abbreviated formula; the complete formula is as whole not proportional to the saturation deficit, this proportionality holds only for a mean month air temperature of 26°C and it rapidly disappears on both sides of this value; with a permissib error of ±5% the abbreviated formula may be used only within the mean monthly temperatures +24 to +28°C but with permissible errors of ±10% it can be used within the range of +21 to +31°C *Subject Headings:* **1. Evaporation formulas 2. Ivanov's evaporation formula.**—*I.L.D.*

10J–103 551.573:551.579(47

Kalinin, G. P. and Makarova, T. T., **Ob ispol'zovanii uravneniia vodnogo balansa dlia raschet i prognoza stoka i faktorov, ego obuslovlivaiushchikh.** [Use of the water balance equation fo calculating and forecasting runoff and factors influencing it.] *Moscow. Tsentral'nyĭ Institu Prognozov, Trudy,* No. 75:29–46, **1958.** 5 figs., 2 tables, 20 refs., 9 eqs. **DWB, DLC**—Data fo 1945–1954 on precipitation, temperature, moisture deficit, wind speed, soil moisture and runoff fo about 30 places in the basins of the Oka, Don, Dnieper, Unzha and Vetluga are used to calculate th evaporation and its relation to runoff by theoretical and by semi-empirical means. A close graphica relation was found between soil moisture in the 0–50 cm and 0–100 cm depth for both winter an summer types of fields in the different regions. In spring the mean soil moisture content was foun to be 200–250 mm in the northern area, 200 mm in the central part and 150–180 mm in the souther part. In summer the values were 100–150 mm, 80–130 mm and 30–40 mm. A formula for calculat ing soil moisture supply is given: $Pn = Pn-1+xn-qn-zn$, where Pn is soil moisture at the give decade, $Pn-1$ at the previous decade, xn = precip., zn = evaporation and qn = inflow (runoff) into th river network for the given decade. Evaporation is computed from the soil moisture for the previou decade and air temperature for the current decade. Another method of calculation of soil moistur is based on the solution of two water balance equations for determining the amount of moisture at th time of snow disappearance, and for the rest of the warm season. Physical methods were based o heat-balance and diffusion methods of THORNTHWAITE and HOLZMAN, BUDYKO, IUDIN and others whereas the semi-empirical methods are according to N. A. BAGROV, M. I. BUDYKO, B. V. POLIAKOV and A. S. KONTORSHCHIKOV. *Subject Headings:* **1. Evaporation-soil moisture relationships 2. Wate balance-method of runoff forecasting 3. Statistical methods of hydrologic forecasting 4. Soi moisture calculations 5. European U.S.S.R.**—*M.R.*

10J–104 551.57

Khrgian, A. Kh., **Fizika atmosfery.** [Physics of the atmosphere.] 2nd ed. Moscow, Gos Izdat. Fiziko-Matematicheskoĭ Literatury, **1958.** Chapter 13, **Isparenie** [Evaporation], p. 231 245. figs., tables, eqs. **DLC** (QC880.K45)—Includes analytical treatment of the molecular kinetic theory of evaporation, the process of water vapor diffusion, evaporation from a limited area, fro water surfaces under natural condition, and from soil. Evaporation-humidity relationships ar considered. A few sample data are presented on monthly values of evaporation from differen

urfaces in various places in the U.S.S.R. (For abstract on the book, *see* 10.7–8, July 1959, *MAB.*) *Subject Heading:* **1. Evaporation.**—*G.T.*

10J–105 551.573

Koenig, Louis (*moderator*) (*Consultant, San Antonio, Texas*), **Evaporation.** *Texas A. and M. College, College Station, Proceedings of the 3rd Annual Conference on Water for Texas, Sept. 1957,* (issued **1958?**). p. 50–54. **DWB** (M79 C748pro), **DLC** (TD201.T37)·—A discussion is carried on among consultants and instructors connected with water supply and the soil concerning evaporation, ts losses, the controlling of bacteria and plants that have the lowest rate of evaporation-transpiration. *Subject Heading:* **1. Evaporation.**—*N.N.*

10J–106 551.573

Konstantinov, A. R., [**Review of**] **Rukovodstvo po proizvodstvu nabliudenii nad ispareniem s sel'skokhoziaĭstvennykh poleĭ, Chast' 2, Nabliudeniia nad ispareniem gradientnym metodom.** [Manual for observations on evaporation from fields, Pt. 2, Observations of evaporation by the gradient method.] *Meteorologiia i Gidrologiia,* Leningrad, No. 7:56–59, July **1958.** 10 refs., eqs. **DWB, DLC**—The basis of the manual reviewed is D. L. LAĬKHTMAN'S computation method in which the stability parameter is determined empirically by relating it to the Richardson number. LAĬKHTMAN'S scheme, however, suffers from a number of faults. It employs the inaccurate classical method of determining the effect of atmospheric temperature stratification upon evaporation; this method does not take into account the effect of relative turbulent moisture exchange upon evaporation. The role of turbulent moisture exchange and its relative importance on evaporation is discussed with the aid of numerical examples. The determination of the level at which the temperature stratification effect is inadequate is described. The method of making gradient measurements uses 50 and 200 cm; this is regarded as inferior to levels 20 and 200 cm, etc. *Subject Headings:* **1. Evaporation from fields 2. Instruction manuals 3. Evaporation measurement techniques.**—*I.L.D.*

10J–107 551.577:551.573(52)

Kotomi, S., **Effective precipitation in Shikoku considered from the potential evapotranspiration.** *Japan. Meteorological Agency, Memoirs of Industrial Meteorology,* 21(2):105–111, **1958.** 6 figs., 3 tables, 5 refs. In Japanese; English summary p. 111. **DWB**—The object of this report is to describe the effective precipitation in Shikoku considered from the evapotranspiration. The annual amount of evapotranspiration is 900–950 mm for the level plains, 700–900 mm for the mountain areas of each prefecture. The value of the concentration of evapotranspiration is about 50%; in other words, half the annual amount of evapotranspiration occurs in three months of summer. Annual and monthly distribution of evapotranspiration has almost the same aspect as the mean temperature distribution. Effective precipitation is 200–500 mm in level plains and 500–800 mm in mountain areas of Kagawa Prefecture. Similarly, it is 500–850 mm and 850–1500 mm for Ehime, 500–850 mm and 850–2000 mm for Tokushima, 1500–2000 mm and 2000–3000 mm for Kochi Prefectures. In Aug. the value of effective precipitation is negative for the northern part of Shikoku, which means the lack of water in this area. For Kochi, the correlation between the amount of effective precipitation and actual precipitation in Sept. is 0.97, while for Tadotsu its value is 0.69 due to the lack of water in Aug. Then it is shown that the effective precipitation in the northern part of Shikoku in Sept. is not a function of actual precipitation alone. The index of humidity is 0.2–0.5 for Kagawa Prefecture, 0.5–1.2 for Ehime, 0.8–2.0 for Tokushima, 2.0–3.0 for Kochi—so Shikoku can be divided into four areas climatologically considered from this index. (*Same item as* 10.4–267, April 1959, *MAB.*) *Subject Headings:* **1. Effective precipitation 2. Evaporation rainfall correlations 3. Potential evapotranspiration 4. Water budget calculations 5. Shikoku, Japan.** —*Author's abstract.*

10J–108 551.573(52):551.579

Kubo, J., **Water surplus and deficit at Tokyo.** *Japan. Meteorological Agency, Memoirs of Industrial Meteorology,* 21(2):93–103, **1958.** 4 figs., 8 tables, 16 refs., eqs. In Japanese; English summary p. 103. **DWB**—For industrial meteorological purposes, it is quite important to ascertain the water balance (or water surplus and deficit) at a place. In 1948, C. W. THORNTHWAITE proposed the concept of potential evapotranspiration and elaborated the method of determining potential evapotranspiration and water balance. In this paper, the author explains, in the first place, the method of determining potential evapotranspiration and water balance, and shows the water balance at Tokyo for the normal year, and for 1944 and 1943. Secondly, calculating the water balance for Tokyo for each year of the 80 yrs [1876–1955], the author shows the annual progression of water surplus and deficit, and the occurrence frequency of monthly water surplus and deficit. Thirdly, the author shows the annual water surplus and deficit at Tokyo, and further shows the occurrence

probability of annual water deficit and its confidence limit with confidence coefficient of 90%. (*Same item as* 10.7–252, July 1959, *MAB.*) *Subject Headings:* **1. Water budget calculations 2. Potentia evapotranspiration 3. Tokyo, Japan.**—*Author's abstract.*

10J–109 551.579(47

Kupriianov, V. V. (*State Hydrological Inst., Leningrad*), **Über experimentelle Untersuchunge der Elemente des Wasserhaushaltes in der UdSSR.** [Experimental investigation of the element of the hydrologic balance in the U.S.S.R.] *Zeitschrift für Meteorologie*, Berlin, 12(1/2):42–4 Jan./Feb. **1958. DWB, DLC**—An account is presented of the Soviet program dealing with in vestigations of elements of the water balance regime of the U.S.S.R. With the aid of numerica examples and specific locations cited in the text, the author discusses the purpose of and procedur for studies on precipitation, elements of the water balance, runoff from slopes and terraces, evapora tion from a water surface, evaporation and transpiration from a land surface, and evaporation i forests. *Subject Headings:* **1. Water balance of U.S.S.R. 2. U.S.S.R.**—*I.L.D.*

10J–110 551.57

Linsley, Ray K., Jr.; Kohler, Max A. and Paulhus, Joseph L. H., **Hydrology for engineers** N. Y. McGraw-Hill, **1958.** Chapter 5, **Evaporation and transpiration.** p. 90–121. 10 figs., 2 tables refs., 13 eqs. **DWB** (M79 L759hy)—Hydrological aspects of evaporation and its computation an explained for engineering students. Meteorological and other environmental factors controllin evaporation; determination of reservoir evaporation by the water-budget, energy-budget and mass transfer methods, and from pan evaporation and meteorological data; techniques of evaporatio reduction; transpiration and its measurement; the water-budget and field-plot determination o evapotranspiration; determination of potential evapotranspiration and its estimation from meteoro logical data; and moisture-deficiency accounting are discussed. Nomograms for computing eva oration from various meteorological elements and from pan data are included. Problems to b solved by students are added. (For abstract on the book, *see* 10.8–9, Aug. 1959, *MAB.*) *Subjec Headings:* **1. Engineering hydrology 2. Evapotranspiration 3. Evaporation from reservoirs.**—*G.T.*

10J–111 551.573:551.579:633.

Makkink, G. F., **De evapotranspiratie van grasland in 1956.** [The evapotranspiration of grass land in 1956.] *Wageningen. Landbouwhogeschool. Instituut voor Biologisch en Scheikundig Onder zoek van Landbouwgewassen, Jaarboek 1957* (*Mededelingen*, No. 15), **1958.** p. 69–72. 3 figs., 2 tables —The monthly amounts of evapotranspiration of groups of lysimeters are presented in a table The evapotranspiration of lysimeter groups and of evaporation pans are compared. Also the cal culated evaporation E_0 is given. Fig. shows how the potential evaporation fluctuates throughou the season. There was no significant influence of the water table on the yield of dry matter, althoug in August and later on with the highest water tables the grass had yellow leaf tips. *Subject Headings* **1. Evapotranspiration 2. Evaporation 3. Water table.**—*Author's abstract.*

10J–112 551.584:551.579(798

*†Mather, John R. and Thornthwaite, Charles W., **Microclimatic investigations at Point Barrow Alaska, 1957–1958.** *Drexel Institute of Technology. Lab. of Climatology, Publications in Climatology* 11(2), **1958.** 239 p. 6 figs., 48 refs., numerous tables. **DWB** (M8 D777p)—Continuous fiel observations of the heat and moisture balance made from June 1957 through Aug. 1958 at Poin Barrow, Alaska, are analyzed and summarized in this monograph. Preliminary testing of equipment during the summer of 1956 was discussed in a previous report (10.3–20, March 1959, *MAB*). In strumentation, site, general weather conditions, observational program, and an analysis of th observations with respect to: (a) heat and moisture budgets; (b) daily heat balance; (c) precipitatio and (d) evapotranspiration are covered in text and illustrated by charts, tables, graphs, profiles, etc About 140 pages of appended tabular data give the actual 24-hourly observations on days whe completed series of observations were made, thrice daily observations on other days during the period and the heat budget computations. Elements covered include soil, heat flux, solar radiation, ne radiation, vapor pressure, wind direction and speed, and air and soil temperature. (*Same item a* 10.8–15, Aug. 1959, *MAB.*) *Subject Headings:* **1. Microclimatic research programs 2. Evapo transpiration in Arctic 3. Heat and moisture budget 4. Point Barrow, Alaska. I. Arctic Institut of North America.**—*M.R.*

10J–113 551.573:551.588.4(931

Mitchell, K. J. and Closs, R. L. (*both, Dept. of Scientific and Industrial Research, New Zealand*) **Loss of moisture from vegetation.** *Nature*, London, 181(4623):1619–1620, June 7, **1958.** fig **DWB**—Theoretical application of the formulas of PENMAN and others to the estimation of the wate requirements of crops has demonstrated a practical influence of weather on natural evaporation Research work has been completed at Palmerston North, New Zealand and the conclusion is reache

at vegetation does influence in great measure the rate of loss of moisture from the soil. Current easurements at a chain of twenty-five microclimatological stations at sites from 35°S to 45°S as ell as from recordings of the diurnal flux of temperature under varying covers of vegetation will .ed more light upon the subject and will be reported at a later date. *Subject Headings:* **1. Vegetation ffects on evaporation 2. Evapotranspiration 3. Palmerston North, N. Z.**—*N.N.*

10J–114 551.573(480,261)

*Nyberg, Alf (*Swedish Met. & Hydrological Inst., Stockholm*), **A determination of some monthly alues of evapotranspiration in Finland and in a region in the northeastern Atlantic.** *Geophysica*, elsinki, 6(3/4):377–387, **1958.** fig., 11 tables, 6 refs., 3 eqs. **DWB, DLC**—A study has been made the monthly evapotranspiration in two regions, one of them covering the area 62.5°N, 5°W Gr., 7.5°N and 5°E Gr. and the other one 60°N, 20°E Gr., 65°N and 30°E Gr. The convergence of the ater vapor flux in the regions has been studied at the levels, surface, 850, 700 and 500 mb, and the otal convergence has been obtained by vertical integration. From precipitation observations and nange in water vapor content in the atmosphere the evapotranspiration has been computed for the onths July and November 1956, February and May 1957. Comparisons have been made with ydrological estimates of the evapotranspiration. *Subject Headings:* **1. Evapotranspiration 2. Finnd 3. Northeastern Atlantic.**—*Author's abstract.*

10J–115 551.573:551.579.5:633

*Ostromecki, Jerzy, **The influence of increasing agricultural production on water utilization of ultivated crops.** *International Union of Geodesy and Geophysics. Association of Scientific Hyrology, Toronto, Sept. 1957*, [*Transactions*], Vol. 2, pub. **1958.** p. 360–380. 10 figs., 8 tables, 3 refs., 10 eqs. **DWB** (M(06) I611g)—Changes in field evaporation has been presented in this eport by the author as a problem which can take place while agricultural production is intensified nd crop yields increase. A mathematical approach illustrates the influence of produced total mount of plants on changes in field evaporation, providing conditions that are decisive for evapration. The analytical data have been compared with the results of hydrological data obtained n one of the river basins. These do conform. *Subject Headings:* **1. Evapotranspiration-crop elationships 2. Evaporation data 3. Crop yield increase.**—*N.N.*

10J–116 551.579.4(443/444)

Pardé, M., **Crues récentes de saison chaude sur la Seine et la Saône.** [Recent floods of the eine and the Saône during the warm season.] *Annales de Géographie*, Paris, 67(362):343–345 uly–Aug. **1958.** 2 refs. **DLC**—Chronicle of warm season floods which have occurred in the Seine nd the Saône basins since the 17th century. These floods during the warm season are very unusual wing to the fact that at the time when summer rains set in, the ground, dried up through evaporaion, generally possesses a high absorbent power and percolation is very active. *Subject Headings:* **. Evaporation effects on floods 2. Seine Basin, France 3. Saône Basin, France.**—*A.V.*

10J–117 551.579.4(449)

Pardé, M., **Crues récentes de pleine saison chaude sur les rivières alpestres occidentales.** Recent floods of western alpine rivers during the height of the warm season.] *Annales de Géoraphie*, Paris, 67(362):345–347, July–Aug. **1958. DLC**—Account and commentaries relating to ome recent floods at the end of spring or in summer on different alpine rivers in Italy, Switzerland nd, principally, France. Floods during the warm season are more frequent in high mountains than n plains owing to the fact that altitude reduces evapotranspiration, and at the same time percolation. Moreover water is supplied through the melting of snow. *Subject Headings:* **1. Evapotranspiration ffects on floods 2. Percolation effects on floods 3. Alpine regions.**—*A.V.*

10J–118 551.573:551.586:633

Penman, H. L. et al., [**Discussion of**] **N. E. Rider: Water losses from various land surfaces and) Reply by Rider.** *Royal Meteorological Society, Quarterly Journal*, 84(360):190–193, April **958. DWB, DLC**—It is the opinion of PENMAN that the range of evapotranspiration reported by . E. RIDER (*see* 10J–74 above) from 3×10^{-6} g/cm²/sec for closely cropped grass, to 40×10^{-6} for eas is beyond comprehension. Some variation could exist but heat losses would set up compensating echanisms and besides there would not be enough heat available to produce the high evaporation r peas. J. L. MONTEITH thinks the formula used by RIDER would apply only under conditions mpossible in nature, i.e., where no horizontal temperature gradient existed, but the high evaporation ould itself produce a steep horizontal temperature gradient which would invalidate the formula. lso the fetch is too short. RIDER admits that is true but is representative of fetch in most crop reas of England, also the extreme values criticized were for only one particular day which was not epresentative and the heat balance on that day was unusual. *Subject Headings:* **1. Evapotranpiration from crops.**—*M.R.*

10J–119 551.5

Perrin, R. M. S., **Rothamsted Experimental Station.** *Nature, London*, 181(4604):242–243, Ja 25, **1958. DWB, DLC**—The author outlines some of the studies in pure and applied science tl are being carried out at the Rothamsted Experimental Station. These include investigations on t microclimate of wheat and potatoes. Data has been obtained on the condensation and evaporati regimes and a special recording anemometer has been developed for measuring low wind spee within the foliage. Also the work of the chemistry department, pedology department, soil mete ology department, botany department, biochemistry department, etc. are briefly described. *Subj Headings:* **1. Evapotranspiration research 2. Rothamsted Experimental Station.**—*I.L.D.*

10J–120 551.501:551.5

Pierce, L. T. (*U. S. W. B., Columbus, Ohio*), **Estimating seasonal and short-term fluctuations evapo-transpiration from meadow crops.** *American Meteorological Society, Bulletin*, 39(2):73–7 Feb. **1958.** 5 figs., 7 refs. **DWB, DLC**—An attempt is made "to correct known deficiencies in t general formula for evapotranspiration as it applies to meadows in Ohio" and to devise a means converting this potential rate into close short term estimates of water use during periods when actu evaporation rates fall far short of the potential. A comparison of measured evapotranspiration w potential evapotranspiration (computed by Thornthwaite's formula) for 1951 indicates an exc of the former over the latter. Thornthwaite's curve for "readjusted" potential evapotranspirati was revised upward by using mean daily temperature to correspond to actual evapotranspirati and the initial estimate was corrected for latitude and length of day. And two correction facto both of which are expressed as a percentage of the potential evapotranspiration are devised in or to obtain estimates of actual evapotranspiration under all conditions. Using double mass cur plotting of computed evapotranspiration against measured evapotranspiration the author develop a correction factor for soil dryness and for stage of crop development. A comparison betwe measured and converted evapotranspiration is presented, and the applicability of this procedure other crops is considered. *Subject Headings:* **1. Evapotranspiration 2. Thornthwaite's formu 3. Ohio.**—*I.L.D.*

10J–121

Prescott, J. A. (*Emeritus Prof. of Agric. Chemistry, Univ. of Adelaide*), **Climatic indices relation to the water balance.** *UNESCO, Arid Zone Research*, 11:48–51, pub. **1958.** fig., tab 18 refs. French summary p. 51. **DWB** (M84 US8cl)—PRESCOTT's index Precipitation/saturati deficit is improved to the form $P/s.d.^{0.75}$ and found to be a useful criterion of aridity, namely wh $P = 5$ $s.d.^{0.75}$, the rainfall is just adequate to keep the soil above wilting point. Limits of des formations in Australia and of monthly maximum $P/s.d.^{0.75} = 5$, and annual $P/s.d.^{0.75} = 25$, appe to be in fair agreement. Soil moisture observations made at Yudnapinna, South Australia (194 1953) are presented and discussed. *Subject Headings:* **1. Aridity index 2. Soil moisture 3. Yudn pinna, South Australia.**—*G.T.*

10J–122 551.571:6

Protserov, A. V., **Agrometeorologicheskie priemy otsenki vlagoobespechennosti sel'skokhozia stvennykh kul'tur.** [Agrometeorological techniques of evaluating the moisture available to crop (In: U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby, **Voprosy agrometeorologii,** by F. F. Davitaia and M. S. Kulik. Moscow, **1958.** p. 25–28. 2 tables, 6 refs.)—The auth reviews the various agrometeorological indices developed to express the moisture requirement of fa crops. The method of S. H. VERIGO expresses in subjective units and "balls" the degree to whi moisture requirements of crops are satisfied depending upon the moisture supply in the soil duri different vegetation periods. It is based upon laws regulating the variation of the soil moistu supply as a function of the supplies themselves, precipitation, temperature, developmental stage plants and soil type. The method of determining the soil moisture provision for spring cro proposed by A. S. KONTORSHCHIKOV, is based upon the use of the transpiration coefficient determin for dry, humid and wet years. The method proposed by A. V. PROTSEROV is based upon determi tion of the moisture requirement of sowings of spring wheat during each period of growth accordi to an indirect index, namely, the sum of mean daily atmospheric moisture deficits (in mm), multipli by 0.6 for the interval sowing-heading and by 0.4 for heading-ripening. Complete fulfillment of quirement is the index of optimum growth conditions with respect to moisture. Actual expenditure moisture for evaporation and transpiration is determined by actual observation or from a nomogra In practice this method of estimating moisture supply is carried out every ten days and the total the entire preceding period. The method developed by M. S. KULIK consists in determining the la of agreement between the moisture requirement of plants and its availability in the soil. *Subj Headings:* **1. Water consumption of plants 2. Plant water requirements.**—*I.L.D.*

10J–123 551.579:551.573:551.588.6

†Rakhmanov, V. V., **Lesa i vlagooborot.** [Forests and moisture exchange.] *Moscow. Tsentral'nyi Institut Prognozov, Trudy*, No. 65:107–152, **1958.** table, 130 refs. **DLC**—A comprehensive and critical survey of the scientific literature during the past 100 years dealing with the role of forests in the moisture cycle is presented. The author concludes that the forest does not accelerate the moisture exchange since its contribution of moisture to the atmosphere is substantially no greater than that of other cultivated land areas. This study contains a detailed and critical discussion of the moisture balance of the earth, the moisture exchange between continents and oceans, the moisture cycle over land and the role of vegetation in general and forests in particular in this cycle. The various contributions by Russian, Soviet, Western European and American investigators to these problems are cited in considerable detail. *Subject Heading:* **1. Forest effects on moisture balance.** —*I.L.D.*

10J–124 551.5:63:06.045

Ramdas, L. A., **Agricultural meteorology.** *World Meteorological Organization, WMO Bulletin*, (4):148–153, Oct. **1958.** 2 figs. **DWB**—A general review of the work of the WMO Commission of Agricultural Meteorology (CAgM); the importance of weather in crop production; studies of microclimates by SUTTON, GEIGER and SCHMIDT in temperate regions and by the author and collaborators in the tropics and subtropics; studies of diffusion of water vapor, CO_2, etc.; and attempts to control evaporation; evapotranspiration studies of THORNTHWAITE, PENMAN and others; development of soil moisture instruments; effects of dew, drought, irrigation and flooding on crops; shelter effects of crops themselves; improvements in crop statistics and crop forecasting, and weather forecasting. *Subject Headings:* **1. Agricultural meteorology 2. WMO Commission on Agricultural Meteorology.**—*M.R.*

10J–125 551.573:551.579(282.272.72)

Rao, B. Subba (*Geophysics Dept., Andhra Univ., Waltair, South India*), **The water balance of the Ohio River basin.** *American Meteorological Society, Bulletin*, 39(3):153–154, March **1958.** 2 figs., table, 2 refs. **DWB, DLC**—Several methods of computing evapotranspiration are discussed and THORNTHWAITE's 1948 formula is considered to be the closest to reality. Using THORNTHWAITE's 1955 modifications, an even closer estimate is achieved, as shown for the Ohio River Basin, for each month and for the year as a whole. The 1948 method gives 29.7 ft; the 1955 method, 29.2 ft and the estimates based on hydrological measurements 28.2 ft—which is considered to be very close agreement. The 1955 method allows for soil moisture reserve of 12 ft instead of 4 ft, and for variation in rate of evapotranspiration with varying moisture reserve (if less than field capacity). Tables and nomograms are used in calculations. (*Same item as* 10.6–245, June 1959, *MAB.*) *Subject Headings:* **1. Evapotranspiration estimation 2. Hydrologic cycle 3. Thornthwaite's method 4. Ohio River Basin.** —*M.R.*

10J–126 551.573:633.1

Robelin, M. and Collier, D., **Evapotranspiration et rendements culturaux.** [Evapotranspiration and crop yields.] *Académie des Sciences, Paris, Comptes Rendus*, 247(20):1774–1776, Nov. 17, **1958.** 4 refs. **DWB, DLC**—Experimental and statistical study of evapotranspiration in relation to crop yields. The various moisture conditions have been realized in vegetation compartments differentiated either by the physical nature of the substratum, or by surface or subterranean irrigation. The production of dry matter by different plants farmed on a large scale, is a linear function of evaporation. This correlation becomes valid from an evapotranspiration deficit in the range of 0% up to values peculiar to the potential evaporation. These plants show a similar sensitivity to the relative deficit of evaporation. *Subject Heading:* **1. Evapotranspiration-crop yield relationships.**—*A.V.*

10J–127 551.577:551.521.1:551.573:633.491

Scholte, Ubing, D. W., **De invloed van de watervoorziening en de totale instraling op de opbrengst van aardappelen.** [The influence of water supply and total radiation upon the yield of potatoes.] *Landbouwkundig Tijdschrift*, Wageningen, 70(6):453–464, June **1958.** 8 figs., 4 tables, 7 refs. **DA**—The influence of water supply upon the yield of potatoes and the dry matter production of tubers was examined on four groups of potato varieties by investigating the water balance of the root zone during the growing period in clay soil near Wageningen. The potential evapotranspiration (E_0) and the evaporation of a free water surface (E_T) were estimated from the energy balance over periods of 10 days. The influence of the total water deficit during the growing period of each group and the yield and weight of 5 kg tubers under water is given. The author gives: (a) The relation between the yields and the quotient precipitation (**N**) + water storage in soil (B) and E_0; (b) The correlation between the total precipitation during the four growing periods in each year and the yield and the total dry matter production; (c) The influence of the total radiation upon the water

consumption and upon the increase of yield and the total dry matter production. The glob radiation during the growing period in the Netherlands can be a reducing factor in the productio of potatoes and of other crops. Precipitation and the total radiation give, in this case, a bett correlation with yield and dry matter production than the estimation of the potential evapotra spiration or the water deficit, since a certain part of the radiant energy is taken up by the soil. (*San item as* 10.7–111, July 1959, *MAB.*) *Subject Headings:* **1. Water supply 2. Global radiation 3. P tential evapotranspiration 4. Potato yield.**—*A.V.*

10J–128 551.579:551.573(6

*Schulze, B. R., **The climate of South Africa according to Thornthwaite's rational classificatio** *South African Geographical Journal*, Johannesburg, 40:31–53, Dec. **1958.** 5 figs., 7 maps, 9 re **DWB**—The annual water balance for South Africa, Southwest Africa, Basutoland, Bechuanala and Swaziland is compiled from temperature and precipitation data for >400 stations using THOR THWAITE'S (1948) method involving a classification of the climates of South Africa as shown tables and graphs. Maps of actual evapotranspiration, areas with annual water deficiency a with annual water surplus, moisture regions, seasonal variation of effective moisture, average annu thermal efficiency, and potential evapotranspiration are presented and curves or histograms, showi synchronous pentad values of the several parameters, including free water evaporation, wind, a evapotranspiration from two lysimeters, plus monthly values of 6 parameters for 1953–1956, i clusive. Solar radiation, wind and r. h. are important factors in evaporation and transpiration the Highweld region of Transvaal, and these factors are not included in THORNTHWAITE'S formul This explains discrepancies between computed and measured evapotranspiration which are cite *Subject Headings:* **1. Moisture balance 2. Thornthwaite's method 3. South Africa.**—*M.R.*

10J–129 551.577:551.579 551.573:551.579.1(4

*Schwarzmann, Herbert, **Vergleichsbetrachtungen über den Wasserhaushalt südwestdeutsch Gewässergebiete.** [Comparative study of the water balance of catchments in southwest Germany *Deutsche Gewässerkundliche Mitteilungen*, Coblenz, 2(2):27–34, April **1958.** 2 figs., 3 tables. **DW** —Extensive tables show annual, winter and summer (half year) precip. for each year from 1946–19 as well as runoff and runoff/precip. coefficients for 9 river areas in the upper Rhine, Danube a Neckar Catchments of Germany. The frequencies of precip. and runoff values are shown graphical and discussed. Relation to evaporation is also discussed and shown in tables. *Subject Headin* **1. Rainfall-runoff relationships 2. Evaporation from catchments 3. Hydrologic balance of wate sheds 4. Southwest Germany.**—*M.R.*

10J–130 551.5:63 551.5

Smith, L. P. (*Brit. Met. Office*), **Farming weather.** London, Nelson, **1958.** 208 p. 35 fig tables, 8 plates. **DLC** (QC863.S65)—Contains a chapter (p. 56–63) on evaporation and transpi tion, in which the author gives a lucid explanation of the energy balance approach to calculati evapotranspiration and moisture deficit. Application to irrigation is discussed in another chapt (p. 64–71). (For abstract on the book, *see* 10.8–28, Aug. 1959, *MAB.*) *Subject Headings:* **1. Ag cultural meteorology 2. Evapotranspiration 3. Great Britain.**—*G.T.*

10J–131 551.573:6

Stanhill, G. (*Natl. Vegetable Res. Station, Wellesbourne, Warwick*), **Evapo-transpiration fr different crops exposed to the same weather.** *Nature*, London, 181(4628):125, July 12, **1958.** fi table, 4 refs. **DWB**—Two crops, grass and carrots, were under observation for evapotranspirati at the crop weather station of Wellesbourne from mid-June until early October 1957. The resu of the investigation are plotted against the measured cumulative evaporation from a standa evaporation tank. The effect of irrigation is illustrated in tabular form, since one crop of carrot a grass was under irrigation while the other received soil-moisture treatment only from rain. Meteo logical observations were used to determine the energy balance for the grass and carrot crops rais under the two soil-moisture treatments and for the open water surface of the evaporation tan Other crops are being investigated. *Subject Headings:* **1. Evapotranspiration from grass 2. Eva transpiration from carrots 3. Warwick, Eng.**—*N.N.*

10J–132 551.573:551.5

Struzer, L. R., **Ob istochnikakh sistematicheskikh oshibok gradientnogo metoda opredelen ispareniia.** [Sources of systematic error in the gradient method of evaporation determinatio *Leningrad. Gosudarstvennyĭ Gidrologicheskiĭ Institut, Trudy*, No. 63:63–85, **1958.** 9 figs., 6 tabl 9 refs., 33 eqs. **DLC**—Systematic errors involved in establishing various parameters (e.g., height instruments, level of displacement and roughness parameter) used in the gradient method (accordi to BUDYKO'S, TIMOFEEV'S, KONSTANTINOV'S or LAĬKHTMAN'S formula) of evaporation determinati

e numerically evaluated. The combined error may be as much as 40% or more of the evaporation alue obtained. Errors resulting from the incorrectness of the formulas, and instrumental errors e not included. The gradient method (with Laĭkhtman's formula) has been adopted as the basis r an official instruction manual (*see also item* 10J–106 above); without considerable revision, however, it would appear to be too inaccurate for use in regular network observations. *Subject Heading:* **Evaporation computation methods.**—*G.T.*

10J–133 551.573:551.511.33:581.11

Suomi, V. E. and Tanner, C. B. (*both Dept. of Soils, Univ. of Wisconsin*), **Evapotranspiration estimates from heat-budget measurements over a field crop.** *American Geophysical Union, Transactions*, 39(2):298–304, April **1958.** 12 figs., 12 refs., 6 eqs. **DWB, DLC**—The heat transfer processes which occur at the earth's surface have direct bearing on many of the physical problems in agriculture that relate to the plant environment. The evapotranspiration from a crop can be estimated from the disposition of solar and sensible energy available at the earth-air interface. A suitable measurement of the heat budget, including net radiation, heat transfer by soil conduction, air-temperature gradient above the crop, and vapor pressure gradient above the crop, will account for the fraction of solar energy used hourly or daily for evapotranspiration. The simple theory, a brief description of the experimental equipment, and some illustrative measurements are discussed (made at the Univ. of Wisconsin Experimental farms at Hancock, Wis., Aug. 19–Sept. 3, 1955). (*Same item as* 10.2–262, Feb. 1959, *MAB.*) *Subject Headings:* **1. Evapotranspiration estimation 2. Soil-air heat exchange.**—*Authors' abstract.*

10J–134 551.573(439.1)

Szesztay, Károly (*Research Institute for Water Resources, Budapest, Hungary*), **Graphs for estimating evaporation from large areas.** *International Union of Geodesy and Geophysics. Association of Scientific Hydrology, Toronto, Sept. 1957,* [*Transactions*], Vol. 2, pub. **1958.** p. 333–359. 13 figs., 3 tables, 9 refs., eqs. **DWB** (M(06)I611g). Also (in slightly more detail) Hungarian version as **Segédletek a területi párolgás meghatározására.** *Hungary. Vizgazdálkodási Tudományos Kutató Intézet, Beszámoló . . . Évi Munkájáról, 1956*, issued **1957.** p. 31–74. 23 figs., 1 tables, 9 refs., 36 eqs. English summary p. 279–280. **DWB** (M(06)H936bes). Also his: **Estimation of the water balance of catchment areas in Hungary.** *Időjárás*, Budapest, 62(6):313–328, Nov./Dec. **1958.** 5 figs., 3 tables, 12 refs., 7 eqs. Russian and Hungarian summaries.—In the summer evaporation season (i.e., in moderate latitudes from March 1 to Oct. 31) evaporation is controlled by factors (1) of the evaporating capacity and (2) the amount of water available for evaporation. Evaporating capacity of drainage areas is determined on the basis of monthly mean vapor-pressure saturation deficit and/or of the mean monthly temperature by graphs drawn from lysimeter data. The amount of water available for evapotranspiration is expressed by indexes computed from precipitation data of the month investigated as well as the two previous months, and from the "winter precipitation index." Graphs for estimating monthly and yearly evapotranspiration of natural drainage areas are presented on the basis of physical considerations and lysimeter data. With the help of monthly evapotranspiration data of 20–30 years for several catchment areas in Hungary, composite graphs are drawn from which means and extremes of monthly and annual evapotranspiration can be readily obtained. In the article in *Időjárás*, the author critically reviews THORNTHWAITE'S method and finds it to be too inaccurate for regions with sufficient hydrologic data. He also presents the method used in Hungary (in less detail than in preceding articles). *Subject Headings:* **1. Evaporation estimation 2. Evapotranspiration 3. Hungary.**—*Author's abstract.*

10J–135 551.579:551.573:912(74)

†Thornthwaite, C. W.; Mather, John R., and Carter, Douglas B., **Three water balance maps of eastern North America.** Foreword by Edward A. Ackerman. Wash., D. C., Resources for the Future, Inc., Nov. **1958.** 47 p. 4 figs., 4 tables, 39 refs. 3 maps (colored, fold, in pocket). **DWB**—The 3 beautifully colored water balance maps: (1) Mean annual water surplus, (2) Mean annual water deficit and (3) Potential evapotranspiration, cover the U. S. and Canada east of the 95th meridian (approximately the Mississippi Basin) and South of James Bay (55°N). The text discusses the history of climatic or precipitation maps; the measurement of evapotranspiration; computing the water balance at a given station; computation of the 3 maps; areal differences in Eastern North America; yearly fluctuations in water balance; differences obtained by different methods of computation, use of the 3 maps, reliability of computed water surplus as a measure of runoff, and future lines of study. Appendix gives monthly values of the elements of the water balance at 50 selected stations in eastern North America. Illustrative graphs and curves, and a selective bibliography, are also included. (*Same item as* 10.8–35, Aug. 1959, *MAB.*) *Subject Headings:* **1. Water balance charts 2. Potential evapotranspiration charts 3. Potential evapotranspiration data 4. Eastern North America.**—*M.R.*

10J–136 551.573:551.582.3(62,5

†Thornthwaite, C. W.; Mather, J. R. and Carter, D. B., **Three water balance maps of southwe Asia.** *Drexel Institute of Technology. Laboratory of Climatology, Publications in Climatolog* 11(1), 1958. 57 p. 3 figs., tables, 61 refs. **DWB** (M8.D777p)—Contains detailed discussion methods of evaporation and evapotranspiration measurement and computation and water balan calculation, including description of the Thornthwaite method of water balance preparation ar mapping, with application to Syria. (For more detailed abstract, *see* 10.10–32, *this issue.*) *Subj Headings:* **1. Water balance charts, Southwest Asia 2. Potential evapotranspiration charts 3. Wor climatic atlases 4. Southwest Asia 5. Egypt.**—*M.R.*

10J–137 551.573(78

*Van der Bijl, Willem, **Evapotranspiration problem: second contribution.** Kansas. Sta College, Manhattan. Dept. of Physics, Contract Cwb-9294, Report, **1957/1958.** 82 p. numero figs. and tables, 4 refs. **DWB** (M73 K16re)—Ch. 1 contains daily amounts of max. sunshine dur tion, total solar radiation on a horizontal surface at Manhattan, Kans., and a nomogram for compu ing sunshine percentage. Ch. 2 relates observational data obtained at the Great Plains Turbulen Field Program (summer 1953). In many diagrams and tables the actual evapotranspiration amoun for 60-min periods as computed by HALSTEAD, SUOMI, LETTAU and THORNTHWAITE are compared various ways. Differences of 50% are common, so that the general conclusion is that at present satisfactory method is available to determine evapotranspiration amounts from meteorological da for periods of one hour. In Ch. 3 the idea of JEN YU WANG to simplify PENMAN'S method by usi sunshine percentage as the major independent variable has been applied to 24-hr periods. T result is disappointing as shown by the diagrams at the end of this chapter. In Ch. 4 the use of n radiometers is discussed. In Ch. 5 J. R. KAKDE presents meteorological observations in and arou a grain sorghum stand during a 28-hr period in Sept. 1958. Results and conclusions are given in f detail. *Subject Headings:* **1. Evapotranspiration data 2. Great Plains Turbulence Field Progra 3. Manhattan, Kans. I. Kakde, J. R.**—*From author's abstract.*

10J–138 551.579:551.573:551.501

van Hylckama, T. E. A., **Modification of the water balance approach for basins within t Delaware Valley.** *Drexel Institute of Technology. Lab. of Climatology, Publications in Climatolog* 11(3):271–291, **1958.** 11 figs., 3 tables, 28 refs. (Contract Nonr-1617(00), Technical Report, N 6.) Appendix, p. 292–302, Nakamura, J. K., **Instructions for evaluating the water balance of t Delaware Basin using the modified 1955 methods.** 5 figs., tables. **DWB** (M8 D777p)—Th actually is a test of the new empirical methods as compared with measured values. The applicabili of the nomograms is positively demonstrated for reasonable accuracy for determining (1) top climatology, (2) effect of snow, (3) direct runoff, and (4) rate of surplus runoff, and it is evident th these apply also to estimation of runoff not controlled. The appendix provides details of the pr cedure and use of the nomograms. *Subject Headings:* **1. Evaporation computation 2. Nomogram 3. Delaware Valley. I. Contract Nonr-1617(00) II. Drexel Institute of Technology. Lab. Climatology.**—*W.N.*

10J–139 551.573:551.556:551.521:581.

Yamaoka, Yoshito (*Faculty of Eng., Yamaguchi Univ., Japan*), **Experimental studies on t relation between transpiration rate and meteorological elements.** *American Geophysical Unio Transactions*, 39(2):249–265, April **1958.** 31 figs., table, 8 eqs., bibliog. p. 264–265. **DWB, DLC** Water loss caused by transpiration is significant, especially on a bright summer day. The utilizati of precipitation as a water resource will be affected largely by transpiration. Thereupon, the i vestigation of the transpiration rate was carried out as a fundamental datum of water resourc using a wind tunnel which can maintain any meteorological condition. Various examinations o the potometer method were performed and the method was found satisfactory in our investigation The transpiration rate obtained by the potometer agreed within ±2.4% with that of the pott plant. The following empirical formulas were obtained from the relation of the transpiration ra to radiation intensity and wind velocity for *Myrica rubra:*

$$T = T_0 \mp v/(0.55 \times 10^{-1.37R}\, v + 0.32 \times 10^{-2.35R})$$
$$T_0 = (2.09R + 1.67\, H_d + 35.62R)$$

Also, the relations of the leaf temperature to transpiration rate and meteorological elements we studied. Some systematic relations were found. (*Same item as* 10.4–250, April 1959, *MAB Subject Headings:* **1. Transpiration rates 2. Water losses 3. Transpiration-radiation intensi relationships 4. Transpiration-wind velocity relationships.**—*Author's abstract.*

1959

10J–140 551.501:551.573

Afanas'ev, N. I., **Opredelenie velichiny ispareniia (obzor rabot, vypolnennykh na Rotamstedskoĭ opytnoĭ stantsii v Anglii).** [Determination of evaporation: review of work carried out at the Rothamsted experimental station in England.] *Meteorologiia i Gidrologiia*, Leningrad, 7:48–49, July **1959.** 3 refs., 8 eqs. Also: Budyko, M. I., **Opredelenie ispareniia po metodu Penmena.** [Determination of evaporation by the Penman method.] *Ibid.*, p. 49–50. 11 refs. **DWB, DLC**—Afanas'ev explains Penman's method on the basis of three of his papers (1948, 1949, 1953). Budyko cites Penman's work more extensively and discusses his approach to evaporation calculation critically. While stating that Penman's work stands out from most non-Soviet literature inasmuch as it includes a modern treatment of the surface heat balance and turbulent exchange, Budyko nevertheless raises several objections against the ideas upon which Penman's method is based. The principal shortcoming of the method, Budyko believes, is the use of evaporation from a water surface as an index in calculating evaporation from land surfaces. Physical conditions of evaporation from water and land surfaces are different due to differences in albedo and turbulent exchange (wind speed, surface roughness). *Subject Headings:* **1. Evaporation measurement techniques 2. Penman's method.**—*G.T.*

10J–141 551.573:581.116

Bonner, James (*Calif. Inst. Technology, Pasadena, Calif.*), **Water transport.** *Science*, Wash., D. C., 129(3347):447–450, Feb. 20, **1959.** 2 figs., table, 20 refs., 5 eqs. **DLC**—A new science of phytoaerodynamics is said to be needed in order to solve some of the problems of transpiration from leaf surfaces (which depend on wind speed-turbulence, etc.). In a broad sense, water transport is defined as material transport of water to, within, and from a plant. The paradox of soil moisture and salt transfer to the roots of plants is partially resolved by the discovery that transfer to roots is partially by vapor transfer in which the salts are left behind in the soil. Transfer in soil tissue has been found not to be strictly in accord with diffusion laws but by differences in DPD (diffusion pressure deficit). The total movement from soil to air is formulated and the process of transpiration from a leaf surface outline and quantitative aspects shown graphically. *Subject Headings:* **1. Transpiration of plants 2. Water transport in plants.**—*M.R.*

10J–142 551.573 551.508.7

†Brooks, Frederick A., **Evaporation and transpiration.** (In his **Introduction to physical microclimatology, Ch. 4–7,** issued Davis, California, Univ. of California, **1959.** p. 113–132. 6 figs., bibliog. (42 refs.) p. 239–241. **DWB** (M84.B873in). Appendix F: Pruitt, W. O. and Angus, D. E., **The Davis weighing lysimeter,** p. 129–132.—The author reviews the thermodynamic equations for evaporation from moist surfaces and bare soil, Penman's formula for evaporation and transpiration, Thornthwaite's formula for potential evapotranspiration, evaporation cooling, sun-drying, fire hazard weather, and heat balance of fields and growing plants. The article on the Davis lysimeter contains a description and diagram of the instrument. Measures taken to minimize errors resulting from oasis effects, lysimeter wall effects, crop, disturbance of soil, etc., are described. *Subject Headings:* **1. Evapotranspiration 2. Davis lysimeter.**—*G.T.*

10J–143 551.573:551.501(282.242)

Cochrane, N. J. (*Sir Wm. Halcrow & Partners, London*), **Observable evapotranspiration in the basin of the River Thames.** *Royal Meteorological Society, Quarterly Journal*, 85(363):57–59, Jan, **1959.** fig., 14 refs. **DWB, DLC**—The measurement of evapotranspiration from large land areas is like the measurement of evaporation from large areas of water, a formidable problem and not often accurately accomplished. Nevertheless, it is essential for an engineer to try to check the results of theoretical or empirical analyses, or small-scale experiments, against nature where natural phenomena are concerned and the results of an analysis of the hydrology of the Thames are presented herein. Conclusions favoring the Thornthwaite method are reached. (*Same item as* 10.7–249, July 1959, *MAB.*) *Subject Headings:* **1. Evapotranspiration measurement techniques 2. River hydrology 3. Thames River Basin.**—*Author's summary.*

10J–144 551.573(778)

Decker, Wayne L. and Gerber, John F., **Field measurements of evapotranspiration as related to environmental factors.** Missouri. Univ. Dept. of Soils, Contract Cwb-9296, Final Report, Feb. 1, **1959.** 37 p. 8 figs., 3 tables, 5 refs., 2 eqs. **DWB** (M73 D295fi)—A progress report on the continued research on field measurements of evapotranspiration as related to certain environmental factors has been presented with a view to determining the effect of the meteorological factors on the rate of water movement from the soil, through the plant and into the atmosphere. These tests were made in 1958 at the Agricultural Engineering Experimental Farm of the University of Missouri, located 6 mi west of the Columbia Municipal Airport. Three covers viz: alfalfa, orchard grass, and

corn, were used to study the evapotranspirational losses. The available data, the water balan sheets for each cover and the analyzed results are given in this report. *Subject Headings:* **1. Evap transpiration from plants 2. Columbia, Mo.**—*N.N.*

10J–145 551.5

Green, F. H. W. (*Nature Conservancy, London*), **Some observations of potential evaporatio 1955–1957.** *Royal Meteorological Society, Quarterly Journal*, 85(364):152–158, April **1959.** 2 figs 2 tables, 9 refs. **DWB, DLC**—The methods of interpreting routine observations with an apparat designed to measure potential evaporation (PE) are discussed, and tables of results are presente With a view to standardizing PE measurements, conditions are defined, resembling those for standa climatological stations. Difficulties in the interpretation of daily observations, because of vario kinds of time-lag, and variations in storage of water in the apparatus, have been encountered b largely overcome. The values obtained are compared with those computed from other availab data by the methods of PENMAN, THORNTHWAITE, and CROWE, in which the conditions are eith specified, or tacitly assumed, to be similar. The values are in general agreement, but it is show that at west coast stations in Britain the observed values tend to be lower than the computed, an more strikingly, that at high-altitude stations, they tend to be higher. *Subject Heading:* **1. Potenti evapotranspiration.**—*Author's abstract.*

10J–146 551.573 551.582.2:63(47

Kharchenko, K. I., **Agroklimaticheskie usloviia i isparenie s sel'skokhoziaĭstvennykh poleĭ stepiakh Nizhnego Dona.** [Agroclimatic conditions and evaporation from farm fields in the stepp of the Lower Don.] *Leningrad. Gosudarstvennyĭ Gidrologicheskiĭ Institut, Trudy*, No. 71:36–8 **1959.** 12 figs., 13+18 tables, 16 refs., 3 eqs. **DLC**—Climatic data and evaporation data for t growing season (May–October) are presented for several stations in the Lower Don steppes. T former include phenological dates, probability of specified temperature levels, soil temperatur relative humidity, sukhoveĭ, precipitation, snow cover, and soil moisture. These data represe periods of varying length during the last twenty years. The evaporation values presented inclu average evaporation from water surfaces at nine stations (ranging from 700 to 1050 mm for t season); comparative curves of evaporation from water and from land surfaces with varying groun water levels (1956 and 1957); evapotranspiration from fallow land, wheat, alfalfa, barley, millet an corn, with corresponding temperature, moisture deficit, wind speed and precipitation value Scatter diagrams are constructed, showing the evapotranspiration/potential evapotranspiratio ratio in relation to productive soil moisture reserve plus precipitation. By means of the empiric formulas derived from these diagrams, evapotranspiration can be calculated for other regions for t different types of soil and plant cover investigated. Additional tabulated data on soil propertie climatic parameters and evaporation are given in an appendix (p. 65–85). *Subject Heading* **1. Climate of Lower Don steppes 2. Agricultural climatology 3. Evapotranspiration data 4. Rost Oblast, U.S.S.R.**—*G.T.*

10J–147 551.511.33:551.571:551.555

†Kraus, E. B. (Australia), **The evaporation-precipitation cycle of the trades.** *Tellus*, Stockhol 11(2):147–158, May **1959.** 5 figs., 2 tables, 18 refs., 8 eqs. **DWB, DLC**—The area distribution surface wind strengths between 30°S and 30°N is expressed as a function of the median velocity, the basis of climatological data. This is used to obtain estimates of evaporation and energy dissip tion over the same area. The main energy supply of the trade circulation is due to condensation the equatorial trough. It depends partly on evaporation into the trade winds at some earlier tim A study of the energy balance shows that this may lead to oscillations with a period of about 3 week corresponding to the mode of the time which elapses between the evaporation and the precipitatio of the same vapor molecules. Disturbances or fluctuation in the direct meridional circulation of t sub-tropics may be initiated by changes in the infra-red cooling rate and by changes in the heig of the tropopause. It is suggested tentatively that this could be caused by changes in the ozo distribution above the tropical tropopause. *Subject Headings:* **1. Trade wind theories 2. Moistu transport 3. Energy balance of trades.**—*Author's abstract.*

10J–148 551.579:551.5

Lufkin, Daniel H., **Atmospheric water vapor divergence and the water balance at the earth surface.** Mass. Institute of Technology, Contract AF 19(604)-2242 (General Circulation Project Scientific Report No. 4, June **1959.** 44 p. 7 figs., 3 tables, 32 refs., 3 eqs. **DWB**—After reviewi the nature and derivation of the Northern Hemisphere water vapor divergence data published b STARR and PEIXOTO (1958, *see* 10.2–259, Feb. 1959, *MAB*), the author presents a new and mo detailed analysis of the divergence field. The relation between the atmospheric moisture divergen

nd the terrestrial branch of the hydrologic cycle is examined in the light of the geology and physi-graphy of many regions which are associated with marked moisture divergence maxima and minima. he relation between the moisture divergence over the seas and the water budget of the sea surface s considered in a new treatment of the empirically derived correlation between salinity and moisture ivergence, resulting in a new formula for the zonal mean salinity as a function of the zonal mean ivergence. The latitudinal variation of the landward transport of oceanic moisture is calculated nd is the first estimate ever made of this quantity. Finally, the implications of the latent heat ransported by moisture are discussed in relation to the formation of numerical models of the general irculation. *Subject Headings:* **1. Hydrologic cycle-soil moisture relationships 2. Water balance at arth's surface.**—*Author's abstract.*

10J–149 551.584.42:551.579:551.573

Mather, John R. (*Drexel Inst. of Technology, Centerton, New Jersey*), **The moisture balance in rassland climatology.** *American Association for the Advancement of Science, Wash., D. C., Publication*, No. 53:251–261, **1959.** 3 figs., table, 7 refs. **DWB** (M86:58 A512gr)—Briefly explains hornthwaite's methods of potential evapotranspiration computation and water-balance bookkeeping, with sample data for Marked Tree, Arkansas. Relation between humidity and aridity index nd plant growth, and application in drought insurance and weatherforecasting are discussed. *Subject Headings:* **1. Grassland climatology 2. Potential evapotranspiration 3. Thornthwaite's ethod.**—*G.T.*

10J–150 551.573(512.317)

Ramage, C. S., **Evapotranspiration in Hong Kong: a second report.** *Pacific Science*, Honolulu, 3(1):81–87, Jan. **1959.** 5 figs., 3 tables, 7 refs. Abstracted from reprint. **DWB** (M(055) H389sc)—Comparison of measured P.E. with values derived from THORNTHWAITE'S and those from PENMAN'S formula, shows the former is not valid for any monsoon or tropical maritime region, at least ot in Hong Kong where the experiments were conducted Oct. 1951 through Sept. 1956. The latter s valid for Hong Kong and may be used for P.E. calculations elsewhere. *Subject Headings:* **1. Evapo-ranspiration 2. Hong Kong.**—*W.N.*

10J–151 551.573:551.584.42

*Shaw, Robert H. et al., **Transpiration and evapotranspiration as related to meteorological actors.** Iowa. State College of Agriculture and Mechanic Arts. Dept. of Agronomy, Contract Dwb-9295, Final Report, April 15, **1959.** 79 p. 24 figs., 3 tables+tables in appendix. **DWB** M73 I639 tr)—Experimental results of evapotranspiration, transpiration and evaporation obtained n 1957 and 1958 at Ames, Iowa, are discussed. The nine 20×25 ft plots, each with 7 ridges and 6 urrows, were checked under these conditions: natural uncovered soil, plastic covered soil, corn lanted soil uncovered and plastic covered. Air temperature was measured with shielded 24 gage nsulated constantan thermocouples at 2.5, 5, 10 and 30 cm above the ground and soil temperatures were taken at 0.6, 5 and 10 cm depths. Net radiation was checked by specifically designed thermal ransducers located in the corn at 1.5 ft height. Wind measurements were made at 1 m above the rop surface with the standard 3-cup anemometer and at 2.5, 5, 10 and 30 cm above the soil with hot wire anemometers. Rain interception was determined by deducting the runoff from the plastic overed plots from the total rainfall falling on the plots. General statements rather than conclusions re given since the experiments will continue with improved instrumentation. Detailed results are resented in curves and tables. *Subject Headings:* **1. Evapotranspiration data 2. Microclimatic data 3. Transpiration data 4. Ames, Iowa.**—*W.N.*

10J–152 551.573:551.501.6

van Hylckama, T. E. A., **A nomogram to determine monthly potential evapotranspiration.** *Monthly Weather Review*, Wash., D. C., 87(3):107–110, March **1959.** fig., table, 7 refs., 13 eqs. **DLC**—A nomogram for the solution of THORNTHWAITE'S empirical relationships among mean monthly temperature, latitude and potential evapotranspiration is constructed. In the form of alignment charts, the nomogram is simple to use and has the added advantages of the temperature scale being labeled in both degrees Celsius and degrees Fahrenheit and of the potential evapotranspiration scale being labeled in both centimeters and inches. *Subject Headings:* **1. Nomograms 2. Evapotranspiration computation 3. Thornthwaite's method.**—*Author's abstract.*

SUPPLEMENTARY MATERIAL

10J–153 551.501:551.5

*Struzer, L. R. and Rusin, N. P., **Sravnenie razlichnykh metodov opredeleniia isparenii sel'skokhoziaĭstvennykh poleĭ.** [Comparison of various methods of determining evaporation fro cultivated fields.] *Leningrad. Gosudarstvennyĭ Gidrologicheskiĭ Institut, Trudy*, 57(111):93–12 **1956.** 8 figs. (2 fold.), 11 tables, 25 refs., 13 eqs. **DWB**—Four methods of computing evaporatio from fields are discussed: (1) water balance method, (2) soil evaporation measurements, (3) turbule diffusion and (4) heat balance, and equations presented for each. An elaborate field experiment w set up at the Dubovka Hydrological Research Laboratory of the Hydrological Institute in 19 and 1954, using 8 or 9 evaporimeters to determine the comparative utility and accuracy of the various methods. Limitations of water balance and thermal balance method are due to lack soil moisture data in the surface layers in one case and lack of radiation and soil temperature data the other. Also the thermal balance method is less accurate than the other. For turbulent diffusio calculations of evaporation one must have series of observations several times a day every few day Evaporimeter measurements can be more regular but are expensive and should be installed diffe ently in different kinds of cultivated fields or crops. Graphic and tabular comparisons of da obtained at Dubovka show wide ranges in results, sometimes of an order of magnitude even for or 10 day means. Sometimes considerable variation occurs between different evaporimeters (i.e plywood and iron) in different locations. *Subject Headings:* **1. Evaporation methods 2. Eva orimeter comparisons 3. Dubovka Hydrological Experiment Station 4. Dubovka, U.S.S.R.**—*M.*

10J–154 551.573:6

Bloodworth, Morris E. (*Texas Agric. Exp. Station*), **Loss of water by evapotranspiratio** *Texas A. and M. College, College Station, Proceedings of the 3rd Annual Conference on Water f Texas, Sept. 1957*, (issued **1958?**). p. 34–37. 4 figs., table, 9 refs. **DWB** (M79 C748 pro), **DL** (TD201.T37)—Evapotranspiration is discussed with particular reference to determining irrigatio needs. Data presented (Texas) include evapotranspiration from various farm crops at vario phenological stages, total water requirement for different crops, water use by phreatophytes, an comparative water loss from bare soil and from cotton. The use of such data in irrigation planni is indicated in general terms. *Subject Headings:* **1. Evapotranspiration from crops 2. Irrigatio requirements 3. Texas.**—*G.T.*

10J–155 551.573:551.5

Bailey, Harry P. (*Dept. of Geog., U. of Calif., L. A.*), **A simple moisture index based upon primary law of evaporation.** *Geografiska Annaler*, Stockholm, 40(3/4):196–215, **1958.** 5 figs 6 tables, 6 eqs. **DWB, DLC**—The archetype of a new simplified, and improved moisture index presented and discussed in comparison with several existing ones. The adoption of the term 1.025^t introduced since it was found experimentally that the term k^t where $k=1.025$ supplied the desire evaporation equivalent. The effective precipitation, $ep=p/1.025^t$ where p and t are in inches an degrees F, respectively, is demonstrated in a nomogram which is believed to be the first example of method allowing interchangeable use of monthly and annual data. The direct computation of a annual index of effective precipitation is then $EP=P/1.025^{t-x}$. Example of "the short method of EP is tabulated for Los Angeles. A thermal analysis along novel lines is prepared for futu presentation as a companion to the present study. *Subject Headings:* **1. Effective precipitatio indexes 2. Evaporation—soil moisture relationships 3. Los Angeles.**—*W.N.*

10J–156 551.579:551.573:551.585.55(82

Burgos, J. J. (*Nat. Met. Serv. of Argentina, Buenos Aires*) and Tschapek, M. (*Inst. of Scien of the Soil and Agrotechnics, Buenos Aires*), **Water storage in semi-arid soils.** *UNESCO, Ar Zone Research*, 11:72–92, pub. **1958.** 6 figs., 17 tables, 36 refs., 2 eqs. French summary p. 9 **DWB** (M84 US8cl)—Characteristic values of water balance (temperature, precipitation, transpir tion, soil moisture, soil structure, etc.) are presented in tables and graphs for 8 stations in the Arge tine pampa, and discussed from the point of view of plant growth. General climatic data, and data soil moisture and water balance variations during a complete (4 year) crop rotation cycle are al presented for Sinelnikovo near Dnepropetrovsk in the Ukrainian steppe (1930–1939). It is fou that in the Northern Hemisphere steppe vegetation develops in climates with less precipitation th in the Southern Hemisphere, owing to the fact that in the Northern Hemisphere practically no wat is consumed in the cold half of the year, while in the Southern Hemisphere the reverse is true. In t author's opinion "this difference and the difference in vegetation would appear to warrant a ne destination—that of pampa—for the type of vegetation characteristic of the Southern Hemisphe (temperate latitudes of Argentina, Australia and South Africa) and high plateaus of the equator regions where evapotranspiration is approximately equal to precipitation." *Subject Heading*

. Steppe climates 2. Water balance of steppes 3. Evapotranspiration from pampas 4. Pampas, rgentina.—*G.T.*

10J–157 551.579:553.623(439.1)

Ubell, Károly, **A Duna-Tisza közi homokhásátg vizháztartása.** [Water balance of the sandy plateau between the Danube and Tisza Rivers.] *Hungary. Vizgazdálkodási Tudományos Kutató Intézet, Beszámóló . . . Évi Munkájáról, 1956*, issued **1957.** p. 159–167. 6 figs., 2 tables, 8 refs., eqs. English summary p. 281–282. **DWB**—The sandy plateau in central Hungary is a region with practically no runoff, as the surface layer absorbs all water and an impermeable clayey substratum keeps it from being lost in underground runoff. The water balance of the region consequently can be assumed as precipitation = evaporation + surface storage (in winter) + ground water storage + soil moisture storage. Three of these elements, namely precipitation, surface storage and ground water storage, as well as atmospheric temperature, vapor pressure, soil temperature, wind speed and evaporation from a free water surface, were measured during the period 1951–1956. From monthly values of these measured elements, monthly evaporation and soil moisture values were computed, different methods of computation being used for different parts of the year. The monthly water balance data obtained are presented in graphs and some of the computed values are compared with measured amounts. Average annual potential evaporation during the 6-year period (based on measured evaporation from a water surface of 1 m²) was 926 mm; the regional evaporation was 584 mm. For the cold half of the year the values were 203 and 116 mm, and for the warm half 723 and 468 mm respectively. *Subject Headings:* **1. Water balance of sand 2. Evaporation from sand 3. Hungary.** —*G.T.*

10J–158 551.573:551.579.5

†*Covey, Winton Guy, Jr., **Testing a hypothesis concerning the quantitative dependence of evapotranspiration on availability of moisture.** Jan. **1959.** Thesis (Ms.)—Texas Agricultural and Mechanical College. 58 p. 7 figs., 7 tables, 29 refs., 86 eqs. Typescript.—For abstract *see* 10C–18, March 1959, *MAB. Subject Headings:* **1. Evaporation-soil moisture relationships 2. Soil surface moisture 3. O'Neill, Nebr.**

10J–159 551.584.4:633.2

Eger, G., **Beiträge zur Kenntnis des Mikroklimas der Mähwiesen und der osmotischen Werte einiger Wiesenpflanzen.** [Contribution on the microclimate of hay meadows and osmotic values of some grasses.] *Zeitschrift für Acker- und Pflanzenbau*, Berlin, 106(3):337–358, Aug. **1958.** 4 figs., 4 tables, 30 refs. English and German summary on p. 354–357. **DLC**—For abstract *see* 10C–26, March 1959, *MAB. Subject Headings:* **1. Meadow microclimatology 2. Osmotic values of grasses 3. Göttingen, Germany.**

10J–160 551.573:551.579.5

Gulidova, I. B. and Afanas'eva, E. A., **Vliianie vlazhnosti pochvy na intensivnost' transpiratsii drevesnykh i kustarnikovykh porod.** [Influence of soil moisture on transpiration intensity by tree and bush species.] *Pochvovedenie*, Moscow, No. 8:46–53, **1957.** fig., 2 tables, 10 refs. **DWB, DLC**—For abstract *see* 10C–37, March 1959, *MAB. Subject Headings:* **1. Evaporation-soil moisture relationships 2. Balashov region, U.S.S.R.**

10J–161 551.555.9:551.573:551.579.5

Rusin, N. P., **Isparenie i teplovoĭ balans pri sukhoveiakh.** [Evaporation and thermal balance during dry winds.] (In: Akademiia Nauk SSSR. Institut Geografii, **Sukhovei, ikh proiskhozhdenie i bor'ba s nimi.** Moscow, **1957.** p. 248–266. 6 figs., 6 tables, 6 refs., 5 eqs.) **DLC** (QC940.R9A6)—(For abstract, *see* 10C–100, March 1959, *MAB. Subject Headings:* **1. Sukhovei effects on evaporation 2. Soil moisture effects on evaporation 3. Sal Steppe, U.S.S.R.**

10J–162 551.573:551.579.5:581.11

Tsel'niker, Iu. L., **Vliianie vlazhnosti obyknovennogo chernozema na transpiratsiiu drevesnykh porod.** [Influence of water content of ordinary chernozem upon transpiration of tree plants.] *Pochvovedenie*, Moscow, No. 5:54–62, May **1957.** 3 figs., 2 tables, 33 refs. **DWB, DLC**—For abstract, *see* 10C–117, March 1959, *MAB. Subject Headings:* **1. Transpiration-soil moisture relationships 2. Derkul'siz, U.S.S.R.**

10J–163 551.579.5:625:631.4

*†Thornthwaite, C. W.; Mather, J. R.; Carter, D. B. (*all, Lab. of Climatology, Centerton, N. J.*) and Molineux, C. E., **Estimating soil moisture and tractionability conditions for strategic planning.** *U. S. Air Force. Cambridge Research Center, Air Force Surveys in Geophysics*, No. 94, March **1958.** 56 p. Pt. 1, **General method.** Pt. 2, **Applications and interpretations.** 10 figs., tables, 19 refs.

DWB (M(055) U587as)—Soil moisture content is the most important factor in determining bearin capacity, shearing strength, and stickiness of soils; or, in other words, the tractionability of a s Knowledge of the balance between incoming precipitation and outgoing evapotranspiration a surface and subsurface runoff provides information on the moisture content in the soil. A meth is presented for computing soil moisture conditions by means of a simple bookkeeping procedu utilizing readily available climatic data. It is thus possible to obtain detailed information on t water balance and its distribution in the ground at any time in a desired area on either a monthly a daily basis. From a discussion of the factors affecting soil tractionability and the influence moisture on tractionability, it is possible to define different classes of the state of the ground physical terms, estimate their probability of occurrence, prepare maps of monthly average s moisture conditions, and correlate these conditions with tractionability requirements. *Subj Headings:* **1. Soil trafficability 2. Thornthwaite's method.**—*Authors' abstract.*

10J–164 551.584.41 551.588.6:551.573:551.57

Friedrich, W., **Der Einfluss des Waldes und des Kahlschlages auf den Abflussvorgang, d Wasserhaushalt und den Bodenabtrag: Wasserbilanz (Wasserhaushalt).** [Effect of forests a clear cut areas on streamflow and water yield, water balance and erosion: Water balance.] *Aus d Walde,* Hannover, No. 3:192–201, **1958.** fig., 2 tables, refs. English summary p. 219.—An attem was made to assess the evapotranspiration losses during the different months of the year and draw a water balance of the clear cut area of the Lange Bramke and of the forest-covered area Wint talbach (Upper Harz Mountains). The clear cut has an annual average figure for evapotranspirati plus interception of 521 mm. The corresponding figure for the forest-covered area is 579 m The distribution of these figures into surface evaporation, transpiration, and interception is shown a figure. The water balance shows that, on the average, from September until the end of Februa water is stored in both experiment areas which is consumed during the period from March until t end of August. The total amount of 222 mm of water stored during winter in the forest-cover area is considerably higher than the 169 mm in the clear cut. *Subject Headings:* **1. Forest climatolo 2. Forest influences on water regime 3. Evapotranspiration 4. Harz Mountains, Germany.** *Author's abstract.*

10J–165 551.573:581.31(44

Cappus, P., **Etude de l'évapotranspiration sur un bassin versant de faible étendue.** [Evap transpiration study in a small catchment basin.] Reprint from *I.U.G.G. Association of Scienti Hydrology, Publication,* No. 38:177–187. **(1956?)** 4 figs. **DWB**—Summer evapotranspirati (E in mm) is studied for the 4 km² Alrance catchment in southern France, with a good coverage rain gages. The computations were made by means of the hydrologic balance, deriving results n only for the summer but even monthly values, which show a good relation to temperature (E = 7t and a fair relation to the psychromatic difference (C), E = 47 θ. *Subject Headings:* **1. Hydr logic cycle 2. Evapotranspiration 3. Alrance, France.**—*A.A.*

10J–166 551.573:633.

Carlson, C. W.; Alessi, J. and Mickelson, R. H., **Evapotranspiration and yield of corn as i fluenced by moisture level, nitrogen fertilization and plant density.** *Soil Science Society of Ameri Proceedings,* 23(3):242–245, May/June **1959.** 3 figs., 4 tables, 10 refs. **DWB, DA**—Yields a evapotranspiration rates by corn grown in Gardena loam at two levels of soil moisture, two pla densities, and several rates of N fertilization were studied for two growing seasons. Neither fertilizer nor plant density influenced yields in the nonirrigated treatment, but in the irrigated trea ment corn yields in both plant densities increased when N fertilizer was applied. Measuremen made on the number of kernels per square foot, and individual kernel weights showed that gra yields were most influenced by the number of kernels produced per unit area. Neither N fertiliz nor plant density appreciably affected the evapotranspiration rate. Evapotranspiration was co siderably greater for the irrigation plots than for the nonirrigation plots. Rates of evapotranspirati were higher in 1957 than in 1956. The pounds of dry matter produced per inch of water used evapotranspiration (water-use efficiency) was appreciably increased by using a high plant densi and N fertilizer. This effect was much less marked in the nonirrigated treatments than in t irrigated. The amount of dry matter produced per inch of water used was greater on the n irrigated treatment than on the irrigated treatment, except at the high N rate in the high pla density. It is apparent that if maximum efficiency of moisture used is to be realized, adequa fertilizer and plant densities are required. *Subject Headings:* **1. Evapotranspiration—crop relatio ships 2. Corn cultivation.**—*Authors' abstract.*

10J–167 551.573:581.1

Evstigneev, A. S. and Popov, A. N., **Ob isparenii s vodnoĭ poverkhnosti porossheĭ rastitel'nost'** [Evaporation from water surfaces covered with vegetation.] *Meteorologiia i Gidrologiia,* Leningra

No. 4:32-34, April 1957. fig., 3 tables, eq. **DWB, DLC**—Preliminary data on evaporation were obtained from a concrete reservoir (8×12×0.8 m) divided into four equal sections in each of which 3 vaporimeters (G.G.I. 3000) were set up. One section was free of vegetation; each of the other three was overgrown with either bulrushes, duckweed or water plantain. Data are presented on total evaporation from each plot for the entire period June–Oct. for each year 1953–1955, for each month of this period and for total evaporation by day and night for each plot for each year. Total evaporation was greatest from plot with bulrushes, the plot with duckweed had the lowest total evaporation, while the open water was next to the lowest. The mean monthly evaporation as a multiple of evaporation from open water is 2.2 for the bulrush plot, 1.3 for the water plantain, and 0.81 for the duckweed. The mean total evaporation at night for the bulrushes is 24%, for the duckweed 48%, for the water plantain 46%, and for the open water 75% of the daytime evaporation. *Subject Headings:* **1. Evaporation from water surfaces 2. Evapotranspiration from aquatic plants.**—*I.L.D.*

10J-168 551.573:581.11(472.3)

Gribanov, N. N., **K voprosu o summarnom isparenii na Karel'skom peresheĭke.** [Evapotranspiration in the Karelian Isthmus.] *Leningrad. Universitet, Uchenye Zapiski*, No. 269 (*Ser. Geog. Nauk*, No. 13):167-174, **1959.** 2 tables, 19 refs., 8 eqs. **DLC**—The total evaporation during the ice free period of the Karelian Isthmus was computed by the method of turbulent diffusion and by the method of heat balance. The data used were observations carried out during the summers of 1953, 1954 and 1955 on atmospheric temperature and humidity at 20 cm and 150 cm heights, wind velocity at 2 m and 1 m, soil surface temperature and at depth of 20 cm, temperature extremes at the ground and in instrument shelters, precipitation, etc. The formula for computing evaporation at the point of observation by turbulent diffusion is $E_1 = 2.1\ k_1 - \Delta e$ (mm/hour), where k_1—coefficient of turbulence at 1 m, Δe—difference of absolute atmospheric humidity at 0.5 m and 2.0 m, above the surface of the soil. The turbulence coefficient is computed either by

$$k_1 = 0.104\ \Delta u^2 \left(1 + 1.38\ \frac{\Delta t}{\Delta u^2 r}\right) \quad \text{or} \quad k_1 = \frac{1.16\ u_1}{\ln \frac{1}{Z_{00}}} \left(1 + 7.5\ \frac{\Delta t}{u_1^2}\right),$$

where u_1—wind velocity at 1 m above the soil surface, u_2—wind velocity at 2 m, Δt—temperature difference at standard heights 0.5 m and 2.0 m, Δu—difference of wind velocity for the same heights, z_{00}—roughness coefficient (in m) of the underlying surface. Evaporation for daytime hours was computed by $N_1 = \theta\,[\beta_1 D(t_1) + \beta_2 D(t_2) + \cdots \beta_m D(t_m)]$, where θ—interval of time (in hours) between observations, $D(t)$—amount of evaporation in the given period, m—number of observations and $\beta_1, \beta_2 \cdots \beta_m$—constants depending upon number of observations. In a given case for observations of 3 hours the daily evaporation is given by $E_2 = 0.93(E_2 + E_{12}) + 4.27(E_{10} + E_{16}) + 1.6\ E_{13}$. The nocturnal evaporation is computed by $E_n = 0.5\ E_7(7 - T)$, where E_7—evaporation for a 7-hour period and T—time of sunrise for a given day. The method of heat balance (V. V. Romanov) involves the computation of monthly mean evaporation for each hour of a day by the formula $E = \dfrac{R_b - Q_f}{60\left(1 + 0.64\ \dfrac{\Delta t}{\Delta e}\right)}$, where E—evaporation in mm/hour, R_b—radiational balance in ca/cm² hour, Q_f—heat flow through the surface of the soil in cal/cm²/hr (in monthly mean value this magnitude is close to zero and hence can be neglected), Δe—difference of absolute atmospheric humidity in mb, Δt—temperature difference at the same levels. By substituting in this equation the terms of radiation balance and absorbed radiation there is obtained

$$E = \frac{\left[\dfrac{(Q+q)_0 \sin h^0}{\Sigma \sin h^0}(1-\alpha)\right] - r}{60\left(1 + 0.64\ \dfrac{\Delta t}{\Delta e}\right)}$$

The results of computations by these methods are presented in tables. *Subject Headings:* **1. Evapotranspiration data 2. Evaporation calculations 3. Karelian Isthmus.**—*I.L.D.*

10J-169 551.573:581.11(62)

Haude, Waldemar, **Die Verteilung der potentiellen Verdunstung in Ägypten.** [Distribution of potential evaporation in Egypt.] *Erdkunde*, Bonn, 13(3):214-224, Sept. **1959.** 5 figs., 2 tables, 15 refs., eqs. English summary p. 214. **DWB**—Investigations were carried out at the recently established Agrometeorological Station near Cairo in 1957, to obtain quantitative data on the evaporation from irrigated land and evapotranspiration of different crops. Potential evaporation

and evapotranspiration were measured, and their relations to type of soil and plant cover analyzed. On the basis of the data obtained and of climatic data, potential evaporation and water balance values are computed for other regions in the Mediterranean area. Evapotranspiration data computed for the Nile region are compared with the quantity of Nile water used for irrigation. *Subject Headings:* **1. Evapotranspiration data 2. Egypt.**—*Author's abstract.*

10J–170 551.573:581.11:551.501.4:551.52

Holdridge, L. R. (*Technical Cooperation Program, Org. of Am. States, San José, Costa Rica*) **Simple method for determining potential evapotranspiration from temperature data.** *Science*, Wash., D. C., 130(3375):572, Sept. 4, **1959.** ref., eq. **DLC**—A value for the total amount of water that, theoretically, could be lost from soil and vegetation, through evaporation and transpiration if sufficient soil moisture were always available, may be obtained readily by multiplying a given time-period factor by the sum of time-unit means of positive centigrade temperatures divided by the number of time units in the period. *Subject Heading:* **1. Potential evapotranspiration computation**—*Author's abstract.*

10J–171 551.573:551.579.5:631.9(25

†Konstantinov, A. R. and Molchanov, A. L., **Otsenka izmenenii isparenііa i vodnogo balansa pochv stepnoĭ i lesostepnoĭ zon Evropeĭskoĭ territorii SSSR pod vliianiem agrolesomeliorativnykh meropriiatiĭ.** [Evaluation of changes in the evaporation and water balance of soils in the steppe and forest steppe zones of the European U.S.S.R. under the effect of agricultural and forest land improvement measures.] *Alma-Ata, Kazakhstan. Kazakhskiĭ Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, 8:64–93, **1957.** 5 figs., 7 tables, 90 refs. **DWB**—The computation of evaporation and water balance as influenced by agricultural improvements in steppe and forest-steppe regions was carried out for the following 4 regions, viz: southeastern part of central black soil zone, centered in the Kamennaia Steppe, the Syrt region (Transvolga), Sal steppes and the central Ukraine. The physical geographic characteristics of these areas are described. The expected evaporation from agricultural fields is determined from the equation $E = k_T Y + E_T + E_P$, where k_T—coefficient of transpiration of agricultural crops; Y—gross yield; E—nonproductive evaporation during the vegetation period and E_P—evaporation of the field during the nonvegetation period. The expected calculation of water balances of the soil is determined from the formula $X = E + y + U + \Delta V$; where X—precipitation; y—surface runoff, U—underground flow and ΔV—variation of water reserves of soil for the interval investigated. The evaporation and water balance of the steppe and forest steppe areas before and after improvements are presented in tables. *Subject Headings:* **1. Evaporation from steppes 2. Water balance of steppes 3. Land management 4. U.S.S.R.**—*I.L.D.*

10J–172 551.573:551.584.4

Molchanov, A. L. and Duginov, V. I., **O pererаspredelenii isparenііa mezhdu produktivnym i neproduktivnym v usloviiakh polezashchitnogo lesorazvedeniia.** [Evaporation redistribution between productive and nonproductive under conditions of forest shelter belt cultivation.] *Alma-Ata, Kazakhstan. Kazakhskiĭ Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, 8:94–99, **1957.** 2 tables, 13 refs. **DWB**—An attempt is made to establish a quantitative relationship between the degree of afforestation of fields and the reduction of evaporation from them. The equation for evaporation rate is derived, namely $E = \rho K(\partial q/\partial z)$ where K—coefficient of turbulent exchange, ρ—air density and ∂q—gradient of specific humidity. Calculations carried out in the Kamennaia Steppe Hydrometeorological Research Institute during the period 1950–1955 are presented and analyzed. Fields situated within forest belts have a nonproductive evaporation on the average 16% lower and a productive evaporation 38% higher than that of fields in the open steppe. The gross water discharge during the vegetation period from sheltered fields is on the average 10% greater than from fields in the open steppe. The percentage of productive evaporation of the total evaporation during the vegetation period is on the average 13% greater in sheltered than in exposed fields; it may be as high as 62% in individual cases. *Subject Headings:* **1. Forest effects on moisture balance 2. Evaporation from fields 3. Kamennaia Steppe, U.S.S.R.**—*I.L.D.*

10J–173 551.573:633.18:551.571

Nakamura, S. and Mihara, Y. (*Natl. Inst. of Agric. Sciences*), **Studies of the transpiration of rice-plant, Pt. 1.** *Journal of Agricultural Meteorology*, Tokyo, 12(2):64–68, Oct. **1956.** 2 figs., 2 tables, 4 refs., eq. In Japanese; English summary p. 68. **DWB**—An experiment was made in the summers of 1954 and 1955 for the purpose of obtaining relationships between transpiration rate of rice plants and meteorological factors under natural conditions. The experimental arrangement is described and illustrated. Total daily transpiration amounts for 8 days as well as diurnal variations at 30 min. intervals for 2 days are tabulated along with data on solar radiation, saturation deficit and wind velocity. The ratio transpiration/saturation deficit is found to show the following ap-

roximate relation to solar radiation: $T/S = R^{\frac{1}{2}\sim 1}$. No definite wind effect upon T/S was found but general tendency appears to exist for T/S to increase with increasing wind velocity up to 6 m/s. *ubject Headings:* **1. Transpiration of rice 2. Saturation deficit 3. Transpiration—wind velocity elationships.**—*G.T.*

10J–174 551.579.5:551.573

Smith, G. W. (*Imperial Coll. Tropical Agri., Trinidad, West Indies*), **The determination of soil moisture under a permanent grass cover.** *Journal of Geophysical Research*, Wash., D. C., 64(4):477–83, April **1959.** 6 figs., table, 18 refs. **DLC**—Using climatological, soil, and plant data, an attempt has been made to calculate the moisture status of a soil under a permanent grass cover. It has been shown that it is insufficient to use formulas which estimate potential evapotranspiration only, such as those of THORNTHWAITE, BLANEY and CRIDDLE, or PENMAN. When these methods were modified to account for decreasing evapotranspiration with decreasing soil moisture, better results were obtained. The ratio of actual to potential evapotranspiration has been denoted by the symbol F. Three different possibilities for the dependence of F on soil moisture have been examined. The theoretical figures have been compared with figures obtained by augering over a period of about 22 months. It is shown, both graphically and statistically, that THORNTHWAITE'S F factor theory is more satisfactory than PENMAN'S or VEIHMEYER'S. When THORNTHWAITE'S method is used, there is no statistically significant difference between moisture deficits based on the PENMAN, BLANEY and CRIDDLE, or THORNTHWAITE equations for potential transpiration. *Subject Headings:* **1. Soil moisture determination 2. Soil moisture under grass 3. Evaporation—soil moisture relationships.** —*Author's abstract.*

10J–175 551.573:551.521

Volobuev, V. R., **O zavisimosti summarnogo ispareniia ot radiatsionnogo balansa zemnoĭ poverkhnosti.** [Dependence of evapotranspiration upon radiation balance at the earth's surface.] *Akademiia Nauk Azerbaidzhanskoĭ SSR, Baku, Doklady*, 14(10):797–800, **1958.** 3 figs., 8 refs. Azerbaijani summary p. 800. **DLC**—By analyzing annual totals of precipitation and runoff during various radiation conditions, the author finds that the natural evaporation rate E_n shows a correlation with the radiation balance R at the earth's surface, which can be expressed by the function $E_n = 4\ OR^{0.73}$, where E_n stands for mean evaporation in regions of ample moisture supply at existing temperature conditions. It can be obtained by means of special computation of hydrological data. On the other hand, it is customary to work with evaporability E_{max}, which is obtained by assuming the entire radiational heat supply to be used for evaporation. In this latter case the relation between evaporation and radiation balance is linear. The purpose of this paper is to interpret the general form of the curve E_n as a function of R, when the difference between E_{max} and E_n increases with increasing R over most of the curve, and in a few cases the values of E_n are higher than E_{max} at small values of R. The first of these two discrepancies is explained by the fact that in assuming a linear relationship between evaporation and radiation balance, account should be taken of energy losses not only for evaporation but also for photosynthesis, etc. The second discrepancy can be explained, for example, in conditions of tundra or quasi-permanent snow cover, where turbulent heat transfer may play an essential part in the annual heat supply for evaporation. *Subject Headings:* **1. Evaporation-radiation correlations 2. Radiation effects on evaporation.**—*Ref. Zhur., Geofiz.*, 6028, 1959.

PART III. REVIEWS, RECENT MONOGRAPHS, AND ANALYTICS FROM SERIALS AND COLLECTED WORKS

Note: Material listed in these sections will not be included in the monthly indexes until abstracted. The item number is mentioned for those titles which have been abstracted in previous issues of **Meteorological Abstracts and Bibliography.**

A. REVIEWS OF IMPORTANT METEOROLOGICAL MATERIAL

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Baur, Franz: **Physikalisch-statistische Regeln als Grundlagen für Wetter- und Witterungsvorhersagen, II** [Physical-statistical rules as bases for forecasts of weather and weather characteres. Vol. 2.] Frankfurt a.M., Akademische Verlagsgesellschaft MBH, 1958. 152 p. figs., tables, bibliogs. Review by M. Teich in *Zeitschrift für Meteorologie*, Berlin, 12(9/10):313–314, Sept.–Oct. 1958. Review by Martin Rodewald in *Annalen der Meteorologie*, Hamburg, 8(9/10):318–319, 1959. (*For abstract on the original, see* 10.7–3, July 1959, *MAB*)

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